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VOLUME III

13

**THE GENERATION AND RADIATION OF SUPERSONIC JET  
NOISE  
VOLUME III TURBULENT MIXING NOISE DATA**

LOCKHEED-GEORGIA COMPANY  
MARIETTA, GEORGIA 30063

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FINAL REPORT FOR PERIOD 6 NOVEMBER 1972 - 6 NOVEMBER 1975

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This report has been reviewed by the Information Office (ASD/OIP) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This report is published in four volumes. Volume I summarizes the work accomplished. Volume II contains a detailed discussion of work accomplished since the publication of the interim report, and all the major conclusions reached during the program. Volume III (this volume) is a data report which presents a detailed compilation of the turbulent mixing noise 1/3-octave spectra. Volume IV, another data report, contains the narrow-band spectra for broadband shock-associated noise. |                       |  |  |

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## PREFACE

This report was prepared by the Lockheed-Georgia Company, Marietta, Georgia, for the Air Force Aero Propulsion Laboratory, Wright-Patterson Air Force Base under Contract F33615-73-C-2032. The report covers work done in the period 6 November 1972 through 6 November 1975. The work described herein is part of the Air Force Aero Propulsion Laboratory's joint program with the Department of Transportation to define and control the noise emission of aircraft propulsion systems.

Mr. Paul Shahady was the Air Force Aero Propulsion Laboratory's Project Engineer. The program is being conducted under Project 3066, Task 14. Dr. Gordon Banerian was the Project Manager for the Department of Transportation. Lockheed's Program Manager was Harry E. Plumblee, Jr.

Major contributors to the work performed under this contract and presented in this report are: Robert H. Burrin, Peter D. Dean, Philip E. Doak, Michael J. Fisher, Sham S. Kapur, Jark C. Lau, Geoffrey M. Lilley, William T. Mayo, Donald M. Meadows, Christopher L. Morfey, Philip J. Morris, David M. Smith, H. K. "Bob" Tanna, Brian J. Tester, and M. Clay Whiffen.

The assistance of the following individuals is gratefully acknowledged: C. Benton Reid and L. V. Mazarella, who operated the test facilities and data acquisition systems; C. R. Huie, who helped in the buildup and operation of the laser velocimeter; R. B. Harrison and C. T. Walker, who constructed and maintained the acoustic and flow facilities; J. P. McKenna, who kept up with the budget and other administrative details, and last, but certainly not least, most gracious appreciation is extended to Barbara C. Reagan for her superb typing of all the manuscripts.

Gratitude is expressed to the University of Southampton for permitting Professor Philip E. Doak, Professor Geoffrey M. Lilley, Dr. Michael J. Fisher, and Dr. Christopher L. Morfey to participate in the performance of the research reported herein.

This report was submitted on 23 June 1976.

Publication of this report does not constitute Air Force approval of the report's findings or conclusions. It is published only for the exchange and stimulation of ideas.



## TURBULENT MIXING NOISE EXPERIMENTS

The characteristics, both spectral and directivity, of the sound field of supersonic shock-free jets are studied by measuring the turbulent mixing noise in the far field from four two-inch diameter nozzles, namely a convergent nozzle for pressure ratios up to critical and three convergent-divergent nozzles having nominal design Mach numbers of 1.4, 1.7, and 2.0, respectively. The measurements were conducted in the Lockheed anechoic facility, which provides a free-field environment. The results from 75 jet exit conditions (combinations of jet exit velocity ratio  $V_j/a_0$  and jet static temperature ratio  $T_j/T_0$ ) are presented in this Volume in a systematic manner in the form of tabulated one-third octave spectra. The test program, described below, was carefully planned in order to obtain results (i) at constant jet efflux temperature with varying jet velocity, and conversely (ii) at constant exit velocity while varying jet efflux temperature. The effects of jet velocity and exhaust temperature on turbulent mixing noise can therefore be assessed independently.

### EXPERIMENTAL PROGRAM CHART

The experimental program is now described in detail with the help of the experimental program chart shown on the following page. The chart essentially shows the envelope of jet static temperature ratio  $T_j/T_0$  (and hence also jet density ratio,  $\rho_j/\rho_0$ ), and jet exit velocity ratio  $V_j/a_0$ , as a function of stagnation temperature ratio  $T_R/T_0$ , and pressure ratio  $P_R/P_0$ . The lower limit of  $V_j/a_0$  is set by the measuring instrumentation (electronic) noise, and not by the rig generated internal noise. The four nozzles employed are the convergent nozzle and the  $M=1.4$ , 1.7, and 2.0 convergent-divergent nozzles. In this study of turbulent mixing noise, the nozzles must be operated at on-design pressure ratios so that the data will not be contaminated by contributions from shock-associated noise. The convergent nozzle can therefore be operated at any pressure ratio up to 1.89, and the corresponding ranges of  $T_j/T_0$  and  $V_j/a_0$  are shown by the shaded area of the chart. In contrast, the three con-div nozzles can be operated at fixed pressure ratios only, and hence the jet exit conditions available with these nozzles are represented by the three curves on the right of the shaded area. The variation of the specific heat ratio,  $\gamma$ , with temperature was incorporated in the preparation of this chart.

The jet operating conditions originally selected for the experimental program are identified by test point numbers (TPN) in the chart. It can be seen that by considering test points on each horizontal line, the jet efflux temperature remains constant while efflux velocity varies. Conversely, on each vertical line, constant efflux velocity is maintained while jet exit temperature is varied.

It should be noted that all data given in this Volume are obtained from two-inch diameter nozzles with the measurement points at 72 nozzle diameters. The normal scaling laws must therefore be applied for application to other measurement configurations.



## MEASUREMENT AND DATA REDUCTION PROCEDURES

The complete experimental program was executed in two parts. The measurements in the rear arc were conducted first with twelve microphones positioned at  $7\frac{1}{2}^\circ$  intervals from  $15^\circ$  to  $97\frac{1}{2}^\circ$  to the downstream jet axis. The entire test program was then repeated to obtain corresponding results in the forward arc, where ten microphones were again placed at  $7\frac{1}{2}^\circ$  intervals over the angular range from  $82\frac{1}{2}^\circ$  to  $150^\circ$  to the jet exhaust. Half-inch B&K microphones Type 4133 with FET cathode followers Type 2619 were utilized throughout the test program. The responses were recorded simultaneously on a 14-channel Honeywell FM tape recorder at 120 inches per second (ips). In order to obtain the 1/3-octave spectra from 200 Hz to 40 KHz by using a Hewlett-Packard real time 1/3-octave audio spectrum analyzer, the tape speed was reduced to 30 ips on playback. The 1/3-octave levels then were recorded on an incremental tape recorder for subsequent detailed analysis by means of a data reduction program developed for use on the Univac 418 digital computer. This program incorporates the microphone frequency response corrections and atmospheric absorption corrections. The values of atmospheric absorption corrections were obtained from Evans, Bass and Sutherland (*The Journal of the Acoustical Society of America*, 1972, Vol. 51, No. 5, Part 2, pp. 1565-1575). The data are corrected to laboratory conditions at the time of each test, and are *not* corrected to standard day conditions. The results finally are displayed to include test conditions and computed jet flow parameters, 1/3-octave acoustic spectra, and computed overall sound pressure levels.

## DATA PRESENTATION

The nominal values of jet operating conditions defining the test points covering the entire experimental program are tabulated in detail, and the various parameters are defined in the list of symbols. It can be seen that for every test point number (TPN), there are two corresponding run numbers (RN); the first run number refers to measurements in the rear arc, whereas the second run number refers to measurements in the forward arc. For every run number, there are three data pages. The first page gives all the information about the test conditions and various jet flow parameters, while the 1/3-octave spectrum levels and the overall sound pressure levels at all microphone positions are tabulated on the second and third pages.

In using the data presented in this report, the following points *must* be considered at all times:

(1) The spectra measured by the  $\theta = 15^\circ$  microphone are in some cases affected by the air-flow generated noise over this microphone.

(2) For  $V_j/a_0 < 0.5$ , although there is no contamination from rig internal noise sources, the spectra are affected by the background noise and the measuring instrumentation (electronic) noise. The background noise produces a slight lift in the spectra at the low frequency end, whereas the instrumentation noise produces a slight lift at the high frequency end. The levels over the majority of the (middle) frequency range, however, are considered to be accurate.

(3) Due to the presence of the kaowool wrapping upstream of the nozzle exit, there is no direct line of sight between the nozzle lip and a microphone placed at large angle in the forward arc. The spectra at  $\theta = 142\frac{1}{2}^\circ$  and  $150^\circ$  are therefore likely to be affected (normally resulting into slightly lower levels than expected), and should be treated with caution. No such problem exists, however, for results at all other angles in the range  $15^\circ \leq \theta \leq 135^\circ$ .

(4) Although the supersonic nozzle calibration tests (shadowgraph tests) revealed no significant shock pattern in the jet flow at design pressure ratios for all con-div nozzles, close examination of the acoustic data indicates that for  $\theta > 105^\circ$ , some of the spectra obtained with these con-div nozzles are slightly contaminated by shock-associated noise at the higher frequencies. This indicates slight imperfections in the machining of the nozzle contour.

TURBULENT MIXING NOISE EXPERIMENTS

TEST POINT CONDITIONS  
(NOMINAL)

# LIST OF SYMBOLS

|                 |  |
|-----------------|--|
| $a_o$           | ambient speed of sound                                   |
| $a_J$           | speed of sound in jet flow at nozzle exit plane          |
| $D$             | jet nozzle diameter                                      |
| $M$             | convergent-divergent nozzle design Mach number (nominal) |
| $M_J$           | jet Mach number, $V_J/a_J$                               |
| $P_R/P_o$       | pressure ratio   |
| $R$             | microphone distance from nozzle exit plane               |
| $RN$            | run number   |
| $TPN$           | test point number  |
| $T_J/T_o$       | static (or jet exit) temperature ratio                   |
| $T_R/T_o$       | stagnation (or total) temperature ratio                  |
| $V_J/a_o$       | jet exit velocity ratio                                  |
| $\gamma$        | ratio of specific heats                                  |
| $\theta$        | microphone angle relative to downstream jet axis         |
| $\rho_J/\rho_o$ | jet exit density ratio                                   |

## DATA PRINTOUT NOMENCLATURE:

|         |                            |
|---------|----------------------------|
| $DJ/DO$ | $= \rho_J/\rho_o$          |
| $DR/DO$ | $= \rho_R/\rho_o$          |
| $DR/DJ$ | $= \rho_R/\rho_J$          |
| $MJ$    | $= M_J$                    |
| $PR$    | $= P_R/P_o$                |
| $PSI$   | $=$ pounds per square inch |
| $TJ/TO$ | $= T_J/T_o$                |
| $TR$    | $= T_R/T_o$                |
| $TR/TJ$ | $= T_R/T_J$                |
| $VJ$    | $= V_J$                    |
| $VJ/AO$ | $= V_J/a_o$                |

# CONVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |          | FORWARD ARC |          |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|----------|-------------|----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO. | RN          | PAGE NO. |
| 1   | 0.35      | 0.980     | 1.020           | 0.353 | 1.40     | 1.090     | 1.000     | 19       | 17 - 19  | 201         | 20 - 22  |
| 2   | 0.40      | 0.971     | 1.030           | 0.406 |          | 1.120     |           | 20       | 23 - 25  | 202         | 26 - 28  |
| 3   | 0.50      | 0.952     | 1.050           | 0.512 |          | 1.196     |           | 21       | 29 - 31  | 203         | 32 - 34  |
| 4   | 0.60      | 0.935     | 1.070           | 0.621 |          | 1.297     |           | 22       | 35 - 37  | 204         | 38 - 40  |
| 5   | 0.70      | 0.893     | 1.120           | 0.741 |          | 1.440     |           | 23       | 41 - 43  | 205         | 44 - 46  |
| 6   | 0.80      | 0.870     | 1.150           | 0.858 |          | 1.617     |           | 24       | 47 - 49  | 206         | 50 - 52  |
| 7   | 0.90      | 0.840     | 1.190           | 0.982 | 1.40     | 1.853     | 1.000     | 25       | 53 - 55  | 127         | 56 - 58  |

# CONVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |          | FORWARD ARC |          |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|----------|-------------|----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO. | RN          | PAGE NO. |
| 8   | 0.50      | 0.976     | 1.025           | 0.506 | 1.40     | 1.191     | 1.026     | 29       | 59 - 61  | 207         | 62 - 64  |
| 9   | 0.60      |           |                 | 0.607 |          | 1.283     | 1.048     | 30       | 65 - 67  | 208         | 68 - 70  |
| 10  | 0.70      |           |                 | 0.709 |          | 1.398     | 1.074     | 31       | 71 - 73  | 130         | 74 - 76  |
| 11  | 0.80      |           |                 | 0.810 |          | 1.540     | 1.104     | 32       | 77 - 79  | 131         | 80 - 82  |
| 12  | 0.90      | 0.976     | 1.025           | 0.911 | 1.40     | 1.712     | 1.138     | 33       | 83 - 85  | 132         | 86 - 88  |



# CONVERGENT NOZZLE

| TPN | $V_J/a_o$ | $T_J/T_o$ | $\rho_J/\rho_o$ | $M_J$ | $\gamma$ | $P_R/P_o$ | $T_R/T_o$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 13  | 0.35      | 1.429     | 0.700           | 0.293 | 1.39     | 1.061     | 1.452     | 26       | 89 - 91   | 234         | 92 - 94   |
| 14  | 0.40      | ↑         | ↑               | 0.335 | ↑        | 1.080     | 1.460     | 34       | 95 - 97   | 210         | 98 - 100  |
| 15  | 0.50      |           |                 | 0.418 |          | 1.127     | 1.477     | 35       | 101 - 103 | 211         | 104 - 106 |
| 16  | 0.60      |           |                 | 0.502 |          | 1.186     | 1.499     | 36       | 107 - 109 | 212         | 110 - 112 |
| 17  | 0.70      |           |                 | 0.586 |          | 1.260     | 1.524     | 37       | 113 - 115 | 137         | 116 - 118 |
| 18  | 0.80      |           |                 | 0.669 |          | 1.348     | 1.553     | 38       | 119 - 121 | 138         | 122 - 124 |
| 19  | 0.90      | ↓         | ↓               | 0.753 | ↓        | 1.453     | 1.587     | 39       | 125 - 127 | 139         | 128 - 130 |
| 20  | 1.16      | 1.429     | 0.700           | 0.971 | 1.39     | 1.824     | 1.691     | 40       | 131 - 133 | 140         | 134 - 136 |

# CONVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 21  | 0.35      | 1.818     | 0.550           | 0.260 | 1.380    | 1.047     | 1.841     | 27       | 137 - 139 | 213         | 140 - 142 |
| 22  | 0.40      |           |                 | 0.297 | 1.380    | 1.062     | 1.849     | 41       | 143 - 145 | 214         | 146 - 148 |
| 23  | 0.50      |           |                 | 0.371 | 1.380    | 1.098     | 1.866     | 42       | 149 - 151 | 215         | 152 - 154 |
| 24  | 0.60      |           |                 | 0.445 | 1.380    | 1.144     | 1.887     | 43       | 155 - 157 | 216         | 158 - 160 |
| 25  | 0.70      |           |                 | 0.519 | 1.380    | 1.199     | 1.911     | 44       | 161 - 163 | 217         | 164 - 166 |
| 26  | 0.80      |           |                 | 0.593 | 1.377    | 1.264     | 1.939     | 45       | 167 - 169 | 146         | 170 - 172 |
| 27  | 0.90      |           |                 | 0.667 | 1.375    | 1.342     | 1.970     | 46       | 173 - 175 | 147         | 176 - 178 |
| 28  | 1.16      |           |                 | 0.860 | 1.373    | 1.610     | 2.069     | 47       | 179 - 181 | 148         | 182 - 184 |
| 29  | 1.33      | 1.818     | 0.550           | 0.986 | 1.370    | 1.846     | 2.145     | 48       | 185 - 187 | 149         | 188 - 190 |

# CONVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 30  | 0.35      | 2.273     | 0.440           | 0.232 | 1.365    | 1.037     | 2.295     | 28       | 191 - 193 | 218         | 194 - 196 |
| 31  | 0.40      |           |                 | 0.265 | 1.365    | 1.049     | 2.302     | 49       | 197 - 199 | 219         | 200 - 202 |
| 32  | 0.50      |           |                 | 0.332 | 1.363    | 1.077     | 2.318     | 50       | 203 - 205 | 220         | 206 - 208 |
| 33  | 0.60      |           |                 | 0.398 | 1.362    | 1.112     | 2.338     | 51       | 209 - 211 | 221         | 212 - 214 |
| 34  | 0.70      |           |                 | 0.464 | 1.362    | 1.155     | 2.361     | 52       | 215 - 217 | 222         | 218 - 220 |
| 35  | 0.80      |           |                 | 0.531 | 1.362    | 1.206     | 2.389     | 72       | 221 - 223 | 155         | 224 - 226 |
| 36  | 0.90      |           |                 | 0.597 | 1.360    | 1.265     | 2.419     | 71       | 227 - 229 | 156         | 230 - 232 |
| 37  | 1.16      |           |                 | 0.769 | 1.355    | 1.464     | 2.512     | 70       | 233 - 235 | 157         | 236 - 238 |
| 38  | 1.33      |           |                 | 0.882 | 1.353    | 1.638     | 2.585     | 69       | 239 - 241 | 158         | 242 - 244 |
| 39  | 1.48      | 2.273     | 0.440           | 0.982 | 1.352    | 1.825     | 2.658     | 68       | 245 - 247 | 159         | 248 - 250 |

# CONVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 40  | 0.35      | 2.857     | 0.350           | 0.207 | 1.345    | 1.029     | 2.878     | 58       | 251 - 253 | 223         | 254 - 256 |
| 41  | 0.40      | ↑         | ↑               | 0.237 | 1.345    | 1.038     | 2.885     | 59       | 257 - 259 | 224         | 260 - 262 |
| 42  | 0.50      |           |                 | 0.296 | 1.345    | 1.060     | 2.900     | 60       | 263 - 265 | 225         | 266 - 268 |
| 43  | 0.60      |           |                 | 0.355 | 1.345    | 1.087     | 2.919     | 61       | 269 - 271 | 226         | 272 - 274 |
| 44  | 0.70      |           |                 | 0.414 | 1.345    | 1.120     | 2.942     | 62       | 275 - 277 | 227         | 278 - 280 |
| 45  | 0.80      |           |                 | 0.473 | 1.345    | 1.159     | 2.968     | 63       | 281 - 283 | 165         | 284 - 286 |
| 46  | 0.90      |           |                 | 0.532 | 1.345    | 1.205     | 2.997     | 64       | 287 - 289 | 166         | 290 - 292 |
| 47  | 1.16      |           |                 | 0.686 | 1.340    | 1.355     | 3.086     | 65       | 293 - 295 | 167         | 296 - 298 |
| 48  | 1.33      | ↓         | ↓               | 0.787 | 1.340    | 1.483     | 3.158     | 66       | 299 - 301 | 168         | 302 - 304 |
| 49  | 1.48      | 2.857     | 0.350           | 0.876 | 1.340    | 1.621     | 3.229     | 67       | 305 - 307 | 169         | 308 - 310 |

# CONVERGENT NOZZLE

| TPN | $v_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 66  | 0.35      | 3.400     | 0.294           | 0.190 | 1.33     | 1.024     | 3.422     | 97       | 311 - 313 | 228         | 314 - 316 |
| 67  | 0.40      |           |                 | 0.217 |          | 1.032     | 3.428     | 98       | 317 - 319 | 229         | 320 - 322 |
| 68  | 0.50      |           |                 | 0.271 |          | 1.050     | 3.443     | 100      | 323 - 325 | 230         | 326 - 328 |
| 69  | 0.60      |           |                 | 0.325 |          | 1.072     | 3.461     | 101      | 329 - 331 | 231         | 332 - 334 |
| 70  | 0.70      |           |                 | 0.380 |          | 1.099     | 3.482     | 102      | 335 - 337 | 232         | 338 - 340 |
| 71  | 0.80      |           |                 | 0.434 |          | 1.131     | 3.507     | 103      | 341 - 343 | 233         | 344 - 346 |
| 72  | 0.90      |           |                 | 0.488 |          | 1.168     | 3.535     | 104      | 347 - 349 | 176         | 350 - 352 |
| 73  | 1.16      |           |                 | 0.629 |          | 1.290     | 3.623     | 105      | 353 - 355 | 177         | 356 - 358 |
| 74  | 1.33      |           |                 | 0.721 |          | 1.393     | 3.693     | 106      | 359 - 361 | 178         | 362 - 364 |
| 75  | 1.48      | 3.400     | 0.294           | 0.802 | 1.33     | 1.502     | 3.763     | 107      | 365 - 367 | 179         | 368 - 370 |

M = 1.4 CONVERGENT-DIVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 50  | 1.16      | 0.717     | 1.395           | 1.37  | 1.400    | 3.051     | 1.000     | 73       | 371 - 373 | 180         | 374 - 376 |
| 51  | 1.33      | 0.942     | 1.061           |       | 1.398    | 3.049     | 1.294     | 74       | 377 - 379 | 181         | 380 - 382 |
| 52  | 1.48      | 1.167     | 0.857           |       | 1.387    | 3.036     | 1.591     | 75       | 383 - 385 | 182         | 386 - 388 |
| 53  | 1.61      | 1.381     | 0.724           |       | 1.377    | 3.023     | 1.870     | 76       | 389 - 391 | 183         | 392 - 394 |
| 54  | 1.83      | 1.784     | 0.560           |       | 1.361    | 3.004     | 2.389     | 77       | 395 - 397 | 184         | 398 - 400 |
| 55  | 2.04      | 2.217     | 0.451           |       | 1.344    | 2.983     | 2.933     | 78       | 401 - 403 | 185         | 404 - 406 |
| 86  | 2.30      | 2.818     | 0.355           | 1.37  | 1.327    | 2.963     | 3.683     | 111      | 407 - 409 | 186         | 410 - 412 |

M = 1.7 CONVERGENT-DIVERGENT NOZZLE

| TPN | $V_J/a_0$ | $T_J/T_0$ | $\rho_J/\rho_0$ | $M_J$ | $\gamma$ | $P_R/P_0$ | $T_R/T_0$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 56  | 1.33      | 0.634     | 1.577           | 1.67  | 1.400    | 4.718     | 1.000     | 79       | 413 - 415 | 187         | 416 - 418 |
| 57  | 1.48      | 0.785     | 1.273           | ↑     | 1.399    | 4.716     | 1.222     | 80       | 419 - 421 | 188         | 422 - 424 |
| 58  | 1.65      | 0.976     | 1.025           |       | 1.392    | 4.704     | 1.510     | 81       | 425 - 427 | 189         | 428 - 430 |
| 59  | 2.02      | 1.463     | 0.683           |       | 1.370    | 4.667     | 2.218     | 82       | 431 - 433 | 190         | 434 - 436 |
| 60  | 2.27      | 1.848     | 0.541           | ↓     | 1.350    | 4.633     | 2.749     | 83       | 437 - 439 | 191         | 440 - 442 |
| 61  | 2.55      | 2.332     | 0.429           | 1.67  | 1.336    | 4.609     | 3.424     | 112      | 443 - 445 | 192         | 446 - 448 |

M = 2.0 CONVERGENT-DIVERGENT NOZZLE

| TPN | $V_J/a_o$ | $T_J/T_o$ | $\rho_J/\rho_o$ | $M_J$ | $\gamma$ | $P_R/P_o$ | $T_R/T_o$ | REAR ARC |           | FORWARD ARC |           |
|-----|-----------|-----------|-----------------|-------|----------|-----------|-----------|----------|-----------|-------------|-----------|
|     |           |           |                 |       |          |           |           | RN       | PAGE NO.  | RN          | PAGE NO.  |
| 62  | 1.48      | 0.570     | 1.754           | 1.96  | 1.400    | 7.353     | 1.000     | 84       | 449 - 451 | 193         | 452 - 454 |
| 63  | 1.95      | 0.990     | 1.010           | 1.96  | 1.386    | 7.328     | 1.724     | 85       | 455 - 457 | 194         | 458 - 460 |
| 64  | 2.35      | 1.438     | 0.696           | 1.96  | 1.362    | 7.287     | 2.437     | 86       | 461 - 463 | 195         | 464 - 466 |



# SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.28 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 69.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 19

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.090$   
TEMPERATURE RATIO  $TR = 0.994$   
MACH NUMBER  $MJ = 0.354$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 0.970$   
JET DENSITY RATIO  $DJ/D0 = 1.031$   
JET VELOCITY RATIO  $VJ/A0 = 0.348$   
JET VELOCITY  $VJ = 393.7$  FPS

$TR/TJ = 1.025$   
 $DR/D0 = 1.096$   
 $DR/DJ = 1.064$   
MASS FLOW = 0.657 POUNDS PER SECOND  
THRUST = 8.06 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 56.9                                  | 0.0                                   | 55.7                                  | 49.5                                  | 50.5                                  | 50.1                                  |
| 250.0                                  | 57.8                                  | 0.0                                   | 57.8                                  | 52.6                                  | 53.3                                  | 52.2                                  |
| 315.2                                  | 58.8                                  | 0.0                                   | 58.6                                  | 52.5                                  | 52.2                                  | 52.4                                  |
| 400.0                                  | 60.6                                  | 0.0                                   | 58.1                                  | 53.8                                  | 53.4                                  | 52.9                                  |
| 500.0                                  | 60.3                                  | 0.0                                   | 59.2                                  | 54.7                                  | 55.1                                  | 54.3                                  |
| 630.0                                  | 60.2                                  | 0.0                                   | 59.3                                  | 55.9                                  | 56.1                                  | 55.6                                  |
| 800.0                                  | 62.3                                  | 0.0                                   | 60.3                                  | 56.6                                  | 57.0                                  | 56.3                                  |
| 1000.0                                 | 61.2                                  | 0.0                                   | 60.3                                  | 57.6                                  | 57.5                                  | 57.1                                  |
| 1250.0                                 | 61.3                                  | 0.0                                   | 61.4                                  | 58.9                                  | 59.0                                  | 58.1                                  |
| 1600.0                                 | 60.1                                  | 0.0                                   | 60.9                                  | 58.7                                  | 59.0                                  | 58.9                                  |
| 2000.0                                 | 58.7                                  | 0.0                                   | 61.0                                  | 58.8                                  | 59.6                                  | 58.8                                  |
| 2500.0                                 | 57.5                                  | 0.0                                   | 60.2                                  | 58.7                                  | 59.6                                  | 58.8                                  |
| 3150.0                                 | 55.9                                  | 0.0                                   | 59.8                                  | 58.6                                  | 59.2                                  | 58.8                                  |
| 4000.0                                 | 57.4                                  | 0.0                                   | 59.1                                  | 58.2                                  | 59.4                                  | 58.9                                  |
| 5000.0                                 | 55.8                                  | 0.0                                   | 57.9                                  | 57.2                                  | 58.9                                  | 58.4                                  |
| 6300.0                                 | 56.4                                  | 0.0                                   | 57.1                                  | 56.9                                  | 58.4                                  | 58.2                                  |
| 8000.0                                 | 55.7                                  | 0.0                                   | 56.1                                  | 55.7                                  | 57.9                                  | 57.4                                  |
| 10000.0                                | 55.2                                  | 0.0                                   | 55.0                                  | 55.0                                  | 57.5                                  | 57.2                                  |
| 12500.0                                | 54.2                                  | 0.0                                   | 54.3                                  | 54.5                                  | 57.2                                  | 56.8                                  |
| 16000.0                                | 51.4                                  | 0.0                                   | 53.1                                  | 53.6                                  | 56.5                                  | 56.2                                  |
| 20000.0                                | 50.4                                  | 0.0                                   | 52.1                                  | 52.9                                  | 55.8                                  | 55.8                                  |
| 25000.0                                | 51.7                                  | 0.0                                   | 51.9                                  | 52.6                                  | 55.4                                  | 55.7                                  |
| 31500.0                                | 56.0                                  | 0.0                                   | 52.1                                  | 53.1                                  | 55.9                                  | 56.1                                  |
| 40000.0                                | 57.6                                  | 0.0                                   | 53.3                                  | 54.4                                  | 58.2                                  | 56.3                                  |
| OVERALL<br>SPL                         | 72.0                                  | 0.0                                   | 72.0                                  | 69.9                                  | 71.1                                  | 70.6                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 49.8                                  | 51.4                                  | 47.8                                  | 48.4                                   | 50.8                                   | 50.3                                   |
| 250.0                                  | 51.6                                  | 51.6                                  | 51.0                                  | 49.9                                   | 49.5                                   | 49.0                                   |
| 315.2                                  | 51.0                                  | 51.4                                  | 50.4                                  | 49.9                                   | 49.8                                   | 49.8                                   |
| 400.0                                  | 51.6                                  | 51.6                                  | 50.6                                  | 50.4                                   | 50.2                                   | 49.3                                   |
| 500.0                                  | 53.2                                  | 52.5                                  | 52.1                                  | 51.8                                   | 52.1                                   | 51.0                                   |
| 630.0                                  | 54.3                                  | 53.8                                  | 53.2                                  | 53.2                                   | 53.4                                   | 52.2                                   |
| 800.0                                  | 55.3                                  | 54.8                                  | 54.3                                  | 54.1                                   | 54.1                                   | 53.0                                   |
| 1000.0                                 | 56.5                                  | 55.6                                  | 55.2                                  | 55.0                                   | 54.4                                   | 54.0                                   |
| 1250.0                                 | 57.5                                  | 56.6                                  | 56.7                                  | 55.7                                   | 55.8                                   | 55.2                                   |
| 1600.0                                 | 58.1                                  | 57.2                                  | 56.8                                  | 56.2                                   | 56.1                                   | 55.4                                   |
| 2000.0                                 | 58.2                                  | 57.9                                  | 57.4                                  | 56.7                                   | 56.7                                   | 56.2                                   |
| 2500.0                                 | 58.4                                  | 57.9                                  | 57.7                                  | 57.2                                   | 57.4                                   | 56.6                                   |
| 3150.0                                 | 58.3                                  | 57.9                                  | 57.6                                  | 57.6                                   | 57.7                                   | 57.0                                   |
| 4000.0                                 | 58.4                                  | 58.1                                  | 57.9                                  | 57.6                                   | 57.7                                   | 57.2                                   |
| 5000.0                                 | 58.1                                  | 57.8                                  | 57.5                                  | 57.5                                   | 57.7                                   | 57.3                                   |
| 6300.0                                 | 57.9                                  | 57.8                                  | 57.2                                  | 57.5                                   | 57.5                                   | 57.3                                   |
| 8000.0                                 | 57.3                                  | 57.3                                  | 56.7                                  | 56.7                                   | 57.1                                   | 56.8                                   |
| 10000.0                                | 57.1                                  | 56.9                                  | 56.1                                  | 56.3                                   | 56.7                                   | 56.6                                   |
| 12500.0                                | 56.7                                  | 56.4                                  | 55.8                                  | 55.9                                   | 56.2                                   | 56.2                                   |
| 16000.0                                | 55.8                                  | 55.9                                  | 55.5                                  | 54.8                                   | 55.6                                   | 55.4                                   |
| 20000.0                                | 55.3                                  | 55.1                                  | 55.0                                  | 54.0                                   | 54.9                                   | 54.3                                   |
| 25000.0                                | 55.1                                  | 54.6                                  | 54.9                                  | 53.5                                   | 54.5                                   | 53.7                                   |
| 31500.0                                | 55.8                                  | 54.7                                  | 54.8                                  | 53.8                                   | 54.7                                   | 53.7                                   |
| 40000.0                                | 61.2                                  | 55.2                                  | 55.3                                  | 54.0                                   | 55.7                                   | 53.9                                   |
| OVERALL<br>SPL                         | 70.5                                  | 69.7                                  | 69.4                                  | 69.0                                   | 69.3                                   | 68.7                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.28 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 60.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 201

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.090  
TEMPERATURE RATIO TR = 1.000  
MACH NUMBER MJ = 0.354  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.976  
JET DENSITY RATIO DJ/D0 = 1.025  
JET VELOCITY RATIO VJ/A0 = 0.349  
JET VELOCITY VJ = 390.3 FPS

TR/TJ = 1.025  
DR/D0 = 1.090  
DR/DJ = 1.064  
MASS FLOW = 0.655 POUNDS PER SECOND  
THRUST = 8.06 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 44.8                                   | 47.3                                   | 50.8                                   | 47.3                                    | 45.9                                    | 52.1                                    |
| 250.0                                  | 48.1                                   | 49.0                                   | 50.5                                   | 46.9                                    | 46.5                                    | 47.7                                    |
| 315.2                                  | 48.6                                   | 49.0                                   | 50.8                                   | 48.9                                    | 48.4                                    | 49.0                                    |
| 400.0                                  | 50.4                                   | 50.6                                   | 51.0                                   | 49.9                                    | 49.8                                    | 50.5                                    |
| 500.0                                  | 52.3                                   | 52.0                                   | 52.3                                   | 51.4                                    | 50.8                                    | 50.3                                    |
| 630.0                                  | 53.8                                   | 53.2                                   | 52.8                                   | 52.2                                    | 51.7                                    | 51.3                                    |
| 800.0                                  | 54.7                                   | 54.6                                   | 54.0                                   | 53.1                                    | 52.8                                    | 52.5                                    |
| 1000.0                                 | 55.7                                   | 54.8                                   | 54.2                                   | 53.8                                    | 53.0                                    | 52.7                                    |
| 1250.0                                 | 56.5                                   | 56.1                                   | 55.3                                   | 54.6                                    | 54.6                                    | 53.9                                    |
| 1600.0                                 | 56.9                                   | 56.3                                   | 55.4                                   | 54.9                                    | 54.5                                    | 53.9                                    |
| 2000.0                                 | 57.4                                   | 57.0                                   | 56.5                                   | 55.9                                    | 55.5                                    | 55.0                                    |
| 2500.0                                 | 57.4                                   | 57.1                                   | 56.3                                   | 56.1                                    | 55.8                                    | 55.2                                    |
| 3150.0                                 | 57.5                                   | 57.2                                   | 56.5                                   | 56.6                                    | 56.2                                    | 55.7                                    |
| 4000.0                                 | 57.5                                   | 57.2                                   | 56.8                                   | 56.6                                    | 56.4                                    | 55.8                                    |
| 5000.0                                 | 57.0                                   | 57.5                                   | 56.9                                   | 56.4                                    | 56.6                                    | 55.6                                    |
| 6300.0                                 | 56.8                                   | 57.7                                   | 56.5                                   | 56.4                                    | 56.7                                    | 56.3                                    |
| 8000.0                                 | 56.7                                   | 57.7                                   | 55.0                                   | 55.6                                    | 55.7                                    | 55.3                                    |
| 10000.0                                | 56.9                                   | 56.9                                   | 54.8                                   | 55.0                                    | 54.9                                    | 54.5                                    |
| 12500.0                                | 56.2                                   | 55.3                                   | 54.3                                   | 54.9                                    | 54.5                                    | 54.1                                    |
| 16000.0                                | 55.3                                   | 55.6                                   | 52.9                                   | 54.4                                    | 54.2                                    | 53.5                                    |
| 20000.0                                | 54.6                                   | 55.6                                   | 52.9                                   | 54.2                                    | 54.2                                    | 53.3                                    |
| 25000.0                                | 55.0                                   | 54.3                                   | 51.5                                   | 53.5                                    | 53.3                                    | 53.3                                    |
| 31500.0                                | 54.9                                   | 54.7                                   | 50.7                                   | 53.9                                    | 53.4                                    | 53.4                                    |
| 40000.0                                | 54.6                                   | 55.1                                   | 50.3                                   | 55.8                                    | 53.7                                    | 54.7                                    |
| OVERALL<br>SPL                         | 69.3                                   | 69.2                                   | 68.1                                   | 68.2                                    | 67.9                                    | 67.6                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 52.4                        | 55.8                        | 50.3                        | 51.3                        |
| 250.0                                  | 47.8                        | 47.9                        | 49.0                        | 49.0                        |
| 315.2                                  | 50.0                        | 50.8                        | 48.8                        | 49.9                        |
| 400.0                                  | 50.7                        | 49.3                        | 48.8                        | 50.2                        |
| 500.0                                  | 50.2                        | 48.9                        | 48.6                        | 49.0                        |
| 630.0                                  | 50.9                        | 50.0                        | 49.3                        | 48.6                        |
| 800.0                                  | 51.8                        | 50.7                        | 50.1                        | 49.0                        |
| 1000.0                                 | 52.2                        | 51.0                        | 50.0                        | 48.9                        |
| 1250.0                                 | 53.0                        | 51.8                        | 50.5                        | 49.0                        |
| 1600.0                                 | 53.2                        | 51.5                        | 50.2                        | 48.8                        |
| 2000.0                                 | 54.3                        | 52.5                        | 51.6                        | 49.6                        |
| 2500.0                                 | 54.5                        | 52.8                        | 51.0                        | 49.1                        |
| 3150.0                                 | 55.0                        | 53.5                        | 51.5                        | 49.5                        |
| 4000.0                                 | 55.2                        | 53.7                        | 51.7                        | 49.6                        |
| 5000.0                                 | 55.1                        | 53.3                        | 51.1                        | 49.0                        |
| 6300.0                                 | 55.2                        | 52.8                        | 50.5                        | 49.0                        |
| 8000.0                                 | 54.6                        | 53.1                        | 50.0                        | 48.1                        |
| 10000.0                                | 54.1                        | 52.1                        | 49.2                        | 47.2                        |
| 12500.0                                | 53.7                        | 51.9                        | 48.9                        | 47.0                        |
| 16000.0                                | 53.6                        | 51.7                        | 49.0                        | 46.7                        |
| 20000.0                                | 53.9                        | 51.5                        | 49.6                        | 47.3                        |
| 25000.0                                | 52.6                        | 50.8                        | 47.8                        | 45.2                        |
| 31500.0                                | 52.4                        | 50.8                        | 47.6                        | 44.9                        |
| 40000.0                                | 52.8                        | 51.6                        | 47.7                        | 46.7                        |
| OVERALL<br>SPL                         | 67.0                        | 65.8                        | 63.7                        | 62.5                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.70 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 68.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 20

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.120$   
TEMPERATURE RATIO  $TR = 0.992$   
MACH NUMBER  $MJ = 0.405$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.961$   
JET DENSITY RATIO  $DJ/D_0 = 1.041$   
JET VELOCITY RATIO  $VJ/A_0 = 0.397$   
JET VELOCITY  $VJ = 449.4$  FPS

$TR/TJ = 1.033$   
 $DR/D_0 = 1.128$   
 $DR/DJ = 1.084$   
MASS FLOW = 0.757 POUNDS PER SECOND  
THRUST = 10.60 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 0.0                                   | 0.0                                   | 0.0                                   | 51.5                                  | 52.5                                  | 50.6                                  |
| 250.0                                  | 0.0                                   | 0.0                                   | 0.0                                   | 55.3                                  | 55.3                                  | 54.0                                  |
| 315.2                                  | 0.0                                   | 0.0                                   | 0.0                                   | 55.7                                  | 55.4                                  | 54.4                                  |
| 400.0                                  | 0.0                                   | 0.0                                   | 0.0                                   | 57.5                                  | 56.7                                  | 56.0                                  |
| 500.0                                  | 0.0                                   | 0.0                                   | 0.0                                   | 58.5                                  | 58.5                                  | 57.1                                  |
| 630.0                                  | 0.0                                   | 0.0                                   | 0.0                                   | 60.1                                  | 60.1                                  | 58.6                                  |
| 800.0                                  | 0.0                                   | 0.0                                   | 0.0                                   | 61.3                                  | 61.0                                  | 60.1                                  |
| 1000.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 62.1                                  | 62.1                                  | 61.0                                  |
| 1250.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 63.4                                  | 63.6                                  | 62.3                                  |
| 1600.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 63.2                                  | 63.4                                  | 62.9                                  |
| 2000.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 63.7                                  | 63.9                                  | 63.1                                  |
| 2500.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 63.4                                  | 63.9                                  | 63.2                                  |
| 3150.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 63.1                                  | 63.9                                  | 63.3                                  |
| 4000.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 62.8                                  | 64.1                                  | 63.2                                  |
| 5000.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 62.0                                  | 63.7                                  | 63.0                                  |
| 6300.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 61.5                                  | 63.4                                  | 62.8                                  |
| 8000.0                                 | 0.0                                   | 0.0                                   | 0.0                                   | 60.4                                  | 62.7                                  | 62.2                                  |
| 10000.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 59.5                                  | 62.2                                  | 61.9                                  |
| 12500.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 58.8                                  | 61.9                                  | 61.7                                  |
| 16000.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 57.8                                  | 60.9                                  | 61.0                                  |
| 20000.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 56.8                                  | 60.1                                  | 60.3                                  |
| 25000.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 56.0                                  | 59.4                                  | 59.8                                  |
| 31500.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 55.6                                  | 59.2                                  | 59.8                                  |
| 40000.0                                | 0.0                                   | 0.0                                   | 0.0                                   | 56.0                                  | 59.7                                  | 59.5                                  |
| OVERALL<br>SPL                         | 72.0                                  | 0.0                                   | 72.0                                  | 74.3                                  | 75.4                                  | 74.8                                  |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 50.6                                  | 52.3                                  | 50.2                                  | 50.1                                   | 51.9                                   | 51.3                                   |
| 250.0                                  | 53.7                                  | 53.6                                  | 53.2                                  | 51.7                                   | 51.7                                   | 50.8                                   |
| 315.2                                  | 53.9                                  | 53.3                                  | 52.7                                  | 52.2                                   | 52.1                                   | 52.0                                   |
| 400.0                                  | 55.2                                  | 54.4                                  | 53.1                                  | 53.3                                   | 53.2                                   | 52.4                                   |
| 500.0                                  | 56.4                                  | 55.8                                  | 54.7                                  | 54.3                                   | 54.2                                   | 53.7                                   |
| 630.0                                  | 57.7                                  | 57.4                                  | 56.7                                  | 56.6                                   | 56.2                                   | 55.9                                   |
| 800.0                                  | 59.0                                  | 58.4                                  | 57.7                                  | 57.4                                   | 56.8                                   | 56.4                                   |
| 1000.0                                 | 60.3                                  | 59.3                                  | 58.7                                  | 58.2                                   | 58.0                                   | 57.7                                   |
| 1250.0                                 | 61.6                                  | 60.6                                  | 60.1                                  | 59.4                                   | 59.4                                   | 58.7                                   |
| 1600.0                                 | 61.9                                  | 61.0                                  | 60.5                                  | 60.1                                   | 59.6                                   | 59.0                                   |
| 2000.0                                 | 62.6                                  | 62.0                                  | 61.4                                  | 60.6                                   | 60.6                                   | 60.1                                   |
| 2500.0                                 | 62.6                                  | 62.1                                  | 61.4                                  | 60.7                                   | 61.1                                   | 60.5                                   |
| 3150.0                                 | 62.8                                  | 62.1                                  | 61.9                                  | 61.4                                   | 61.5                                   | 61.1                                   |
| 4000.0                                 | 63.1                                  | 62.6                                  | 62.0                                  | 61.6                                   | 61.6                                   | 61.4                                   |
| 5000.0                                 | 62.9                                  | 62.4                                  | 61.5                                  | 61.5                                   | 61.6                                   | 61.5                                   |
| 6300.0                                 | 63.0                                  | 62.4                                  | 61.6                                  | 61.6                                   | 61.7                                   | 61.6                                   |
| 8000.0                                 | 62.3                                  | 61.9                                  | 61.0                                  | 60.9                                   | 61.2                                   | 61.3                                   |
| 10000.0                                | 62.0                                  | 61.5                                  | 60.6                                  | 60.3                                   | 60.8                                   | 61.0                                   |
| 12500.0                                | 61.8                                  | 61.1                                  | 60.2                                  | 59.9                                   | 60.3                                   | 60.6                                   |
| 16000.0                                | 61.1                                  | 60.6                                  | 59.9                                  | 59.0                                   | 59.8                                   | 59.8                                   |
| 20000.0                                | 60.7                                  | 59.7                                  | 59.3                                  | 58.1                                   | 58.8                                   | 58.6                                   |
| 25000.0                                | 60.5                                  | 59.1                                  | 59.0                                  | 57.4                                   | 58.2                                   | 57.8                                   |
| 31500.0                                | 60.9                                  | 58.6                                  | 58.7                                  | 56.9                                   | 58.0                                   | 57.1                                   |
| 40000.0                                | 63.0                                  | 58.5                                  | 58.5                                  | 56.6                                   | 58.5                                   | 56.9                                   |
| OVERALL<br>SPL                         | 74.8                                  | 73.9                                  | 73.3                                  | 72.7                                   | 73.0                                   | 72.7                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.70 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 60.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 202

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.120  
TEMPERATURE RATIO TR = 1.000  
MACH NUMBER MJ = 0.405  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.968  
JET DENSITY RATIO DJ/D0 = 1.033  
JET VELOCITY RATIO VJ/A0 = 0.399  
JET VELOCITY VJ = 446.0 FPS

TR/TJ = 1.033  
DR/D0 = 1.120  
DR/DJ = 1.084  
MASS FLOW = 0.754 POUNDS PER SECOND  
THRUST = 10.60 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 48.6                                   | 50.8                                   | 50.9                                   | 50.4                                    | 49.0                                    | 52.0                                    |
| 250.0                                  | 50.7                                   | 51.9                                   | 51.0                                   | 50.3                                    | 49.3                                    | 49.6                                    |
| 315.2                                  | 51.6                                   | 52.3                                   | 51.6                                   | 52.0                                    | 51.0                                    | 51.3                                    |
| 400.0                                  | 53.5                                   | 53.6                                   | 53.0                                   | 52.7                                    | 52.8                                    | 53.7                                    |
| 500.0                                  | 56.0                                   | 55.4                                   | 55.2                                   | 54.9                                    | 54.4                                    | 54.1                                    |
| 630.0                                  | 56.8                                   | 56.5                                   | 56.0                                   | 55.6                                    | 55.0                                    | 54.7                                    |
| 800.0                                  | 58.3                                   | 58.1                                   | 57.1                                   | 56.8                                    | 56.1                                    | 55.8                                    |
| 1000.0                                 | 59.5                                   | 58.7                                   | 57.8                                   | 57.3                                    | 56.7                                    | 56.1                                    |
| 1250.0                                 | 60.4                                   | 59.8                                   | 59.2                                   | 58.6                                    | 58.0                                    | 57.3                                    |
| 1600.0                                 | 60.6                                   | 60.1                                   | 59.4                                   | 58.9                                    | 58.2                                    | 57.6                                    |
| 2000.0                                 | 61.3                                   | 60.6                                   | 60.2                                   | 59.9                                    | 59.2                                    | 58.8                                    |
| 2500.0                                 | 61.6                                   | 60.8                                   | 60.1                                   | 60.2                                    | 59.8                                    | 59.1                                    |
| 3150.0                                 | 61.6                                   | 61.4                                   | 60.6                                   | 60.7                                    | 60.2                                    | 59.6                                    |
| 4000.0                                 | 61.7                                   | 61.7                                   | 60.9                                   | 60.7                                    | 60.6                                    | 59.6                                    |
| 5000.0                                 | 61.3                                   | 61.9                                   | 61.1                                   | 60.7                                    | 60.6                                    | 59.6                                    |
| 6300.0                                 | 61.0                                   | 62.1                                   | 61.0                                   | 60.8                                    | 60.6                                    | 60.1                                    |
| 8000.0                                 | 61.0                                   | 62.2                                   | 59.9                                   | 60.2                                    | 60.1                                    | 59.3                                    |
| 10000.0                                | 61.5                                   | 61.5                                   | 59.7                                   | 59.8                                    | 59.6                                    | 58.9                                    |
| 12500.0                                | 61.3                                   | 60.1                                   | 59.6                                   | 59.4                                    | 59.3                                    | 58.2                                    |
| 16000.0                                | 59.9                                   | 60.3                                   | 58.1                                   | 58.8                                    | 58.8                                    | 57.6                                    |
| 20000.0                                | 58.7                                   | 60.2                                   | 58.2                                   | 58.2                                    | 58.3                                    | 57.2                                    |
| 25000.0                                | 59.8                                   | 59.0                                   | 57.8                                   | 57.8                                    | 57.8                                    | 57.2                                    |
| 31500.0                                | 59.6                                   | 59.4                                   | 57.8                                   | 57.9                                    | 57.7                                    | 57.5                                    |
| 40000.0                                | 59.2                                   | 59.9                                   | 58.0                                   | 58.8                                    | 57.6                                    | 58.4                                    |
| OVERALL<br>SPL                         | 73.4                                   | 73.4                                   | 72.3                                   | 72.2                                    | 71.9                                    | 71.3                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 52.9  |       | 56.5  |       | 51.5  |       | 53.3  |  |
| 250.0   |       | 51.0  |       | 50.6  |       | 51.7  |       | 52.1  |  |
| 315.2   |       | 51.9  |       | 52.4  |       | 51.0  |       | 51.0  |  |
| 400.0   |       | 53.5  |       | 52.1  |       | 51.5  |       | 52.2  |  |
| 500.0   |       | 53.4  |       | 52.7  |       | 51.7  |       | 51.8  |  |
| 630.0   |       | 54.1  |       | 53.4  |       | 52.3  |       | 51.6  |  |
| 800.0   |       | 55.2  |       | 54.2  |       | 52.9  |       | 52.2  |  |
| 1000.0  |       | 55.8  |       | 54.4  |       | 53.5  |       | 52.3  |  |
| 1250.0  |       | 56.6  |       | 55.5  |       | 54.2  |       | 52.4  |  |
| 1600.0  |       | 56.9  |       | 55.7  |       | 54.0  |       | 52.4  |  |
| 2000.0  |       | 58.1  |       | 56.8  |       | 55.2  |       | 53.3  |  |
| 2500.0  |       | 58.4  |       | 56.9  |       | 55.1  |       | 53.3  |  |
| 3150.0  |       | 59.2  |       | 57.9  |       | 55.8  |       | 53.9  |  |
| 4000.0  |       | 59.5  |       | 58.0  |       | 56.1  |       | 53.8  |  |
| 5000.0  |       | 59.4  |       | 57.5  |       | 55.5  |       | 53.3  |  |
| 6300.0  |       | 59.8  |       | 57.7  |       | 55.6  |       | 53.8  |  |
| 8000.0  |       | 59.0  |       | 57.3  |       | 54.6  |       | 52.7  |  |
| 10000.0 |       | 58.8  |       | 56.4  |       | 54.8  |       | 52.2  |  |
| 12500.0 |       | 58.3  |       | 56.0  |       | 53.5  |       | 51.5  |  |
| 16000.0 |       | 58.0  |       | 55.6  |       | 53.3  |       | 50.8  |  |
| 20000.0 |       | 57.6  |       | 55.1  |       | 53.1  |       | 50.6  |  |
| 25000.0 |       | 57.0  |       | 54.6  |       | 52.4  |       | 49.3  |  |
| 31500.0 |       | 56.9  |       | 54.4  |       | 52.3  |       | 48.8  |  |
| 40000.0 |       | 57.2  |       | 55.0  |       | 52.2  |       | 49.0  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 71.0  |       | 69.5  |       | 67.6  |       | 66.0  |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.78 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 68.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 21

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.196  
TEMPERATURE RATIO TR = 0.992  
MACH NUMBER MJ = 0.512  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.943  
JET DENSITY RATIO DJ/D0 = 1.060  
JET VELOCITY RATIO VJ/A0 = 0.497  
JET VELOCITY VJ = 562.4 FPS

TR/TJ = 1.052  
DR/D0 = 1.205  
DR/DJ = 1.136  
MASS FLOW = 0.966 POUNDS PER SECOND  
THRUST = 16.91 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 0.0                                   | 0.0                                   | 61.0                                  | 56.9                                  | 56.2                                  | 55.5                                  |
| 250.0                                  | 0.0                                   | 0.0                                   | 63.4                                  | 60.6                                  | 59.5                                  | 58.1                                  |
| 315.2                                  | 0.0                                   | 0.0                                   | 66.4                                  | 62.5                                  | 61.0                                  | 59.9                                  |
| 400.0                                  | 0.0                                   | 0.0                                   | 67.2                                  | 64.8                                  | 63.0                                  | 61.7                                  |
| 500.0                                  | 0.0                                   | 0.0                                   | 69.0                                  | 65.8                                  | 64.8                                  | 62.7                                  |
| 630.0                                  | 0.0                                   | 0.0                                   | 70.4                                  | 67.8                                  | 66.6                                  | 65.3                                  |
| 800.0                                  | 0.0                                   | 0.0                                   | 71.7                                  | 68.4                                  | 68.4                                  | 66.9                                  |
| 1000.0                                 | 0.0                                   | 0.0                                   | 72.6                                  | 70.3                                  | 69.4                                  | 67.9                                  |
| 1250.0                                 | 0.0                                   | 0.0                                   | 73.0                                  | 71.2                                  | 70.8                                  | 69.3                                  |
| 1600.0                                 | 0.0                                   | 0.0                                   | 72.4                                  | 71.2                                  | 70.9                                  | 69.9                                  |
| 2000.0                                 | 0.0                                   | 0.0                                   | 73.0                                  | 71.5                                  | 71.7                                  | 70.7                                  |
| 2500.0                                 | 0.0                                   | 0.0                                   | 72.6                                  | 71.2                                  | 71.5                                  | 70.6                                  |
| 3150.0                                 | 0.0                                   | 0.0                                   | 71.8                                  | 71.5                                  | 71.5                                  | 70.8                                  |
| 4000.0                                 | 0.0                                   | 0.0                                   | 70.9                                  | 70.8                                  | 71.7                                  | 70.9                                  |
| 5000.0                                 | 0.0                                   | 0.0                                   | 69.8                                  | 70.0                                  | 71.4                                  | 70.9                                  |
| 6300.0                                 | 0.0                                   | 0.0                                   | 68.9                                  | 69.7                                  | 71.0                                  | 70.9                                  |
| 8000.0                                 | 0.0                                   | 0.0                                   | 67.3                                  | 68.7                                  | 70.5                                  | 70.4                                  |
| 10000.0                                | 0.0                                   | 0.0                                   | 66.6                                  | 68.2                                  | 70.1                                  | 70.1                                  |
| 12500.0                                | 0.0                                   | 0.0                                   | 65.5                                  | 67.0                                  | 69.7                                  | 69.9                                  |
| 16000.0                                | 0.0                                   | 0.0                                   | 64.2                                  | 66.0                                  | 68.8                                  | 69.4                                  |
| 20000.0                                | 0.0                                   | 0.0                                   | 62.7                                  | 64.7                                  | 67.8                                  | 68.9                                  |
| 25000.0                                | 0.0                                   | 0.0                                   | 61.9                                  | 63.7                                  | 67.1                                  | 68.8                                  |
| 31500.0                                | 0.0                                   | 0.0                                   | 60.9                                  | 62.7                                  | 66.3                                  | 69.0                                  |
| 40000.0                                | 0.0                                   | 0.0                                   | 60.5                                  | 62.6                                  | 65.8                                  | 70.2                                  |
| OVERALL<br>SPL                         | 72.0                                  | 0.0                                   | 83.2                                  | 82.2                                  | 82.9                                  | 82.6                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 55.5                                  | 55.5                                  | 54.9                                  | 55.0                                   | 54.5                                   | 55.0                                   |
| 250.0                                  | 57.8                                  | 57.4                                  | 57.2                                  | 56.6                                   | 56.2                                   | 55.6                                   |
| 315.2                                  | 58.7                                  | 58.7                                  | 58.4                                  | 57.1                                   | 56.9                                   | 57.2                                   |
| 400.0                                  | 61.2                                  | 60.4                                  | 59.0                                  | 58.9                                   | 58.9                                   | 57.5                                   |
| 500.0                                  | 62.6                                  | 61.0                                  | 60.2                                  | 60.1                                   | 59.0                                   | 58.5                                   |
| 630.0                                  | 64.4                                  | 63.4                                  | 62.8                                  | 62.2                                   | 62.2                                   | 61.6                                   |
| 800.0                                  | 65.6                                  | 65.0                                  | 64.1                                  | 63.0                                   | 63.3                                   | 62.5                                   |
| 1000.0                                 | 67.0                                  | 66.2                                  | 65.2                                  | 64.2                                   | 64.4                                   | 63.6                                   |
| 1250.0                                 | 68.6                                  | 67.6                                  | 66.7                                  | 66.1                                   | 65.6                                   | 65.2                                   |
| 1600.0                                 | 68.7                                  | 67.7                                  | 67.1                                  | 66.5                                   | 66.3                                   | 65.5                                   |
| 2000.0                                 | 69.3                                  | 68.8                                  | 68.0                                  | 67.6                                   | 67.0                                   | 66.4                                   |
| 2500.0                                 | 69.5                                  | 68.8                                  | 68.2                                  | 67.5                                   | 67.5                                   | 67.2                                   |
| 3150.0                                 | 69.9                                  | 69.3                                  | 68.7                                  | 68.3                                   | 68.1                                   | 67.9                                   |
| 4000.0                                 | 69.9                                  | 69.7                                  | 68.9                                  | 68.6                                   | 68.5                                   | 68.2                                   |
| 5000.0                                 | 70.1                                  | 69.7                                  | 68.7                                  | 68.7                                   | 68.8                                   | 68.5                                   |
| 6300.0                                 | 70.3                                  | 69.9                                  | 68.6                                  | 68.9                                   | 69.0                                   | 69.0                                   |
| 8000.0                                 | 69.9                                  | 69.5                                  | 68.4                                  | 68.2                                   | 68.5                                   | 68.7                                   |
| 10000.0                                | 69.7                                  | 69.2                                  | 67.9                                  | 68.0                                   | 68.1                                   | 68.6                                   |
| 12500.0                                | 69.4                                  | 68.7                                  | 67.5                                  | 67.6                                   | 67.6                                   | 68.0                                   |
| 16000.0                                | 68.5                                  | 68.2                                  | 67.1                                  | 66.9                                   | 67.1                                   | 67.3                                   |
| 20000.0                                | 68.1                                  | 67.3                                  | 66.6                                  | 65.8                                   | 66.1                                   | 65.9                                   |
| 25000.0                                | 67.8                                  | 66.6                                  | 66.2                                  | 65.1                                   | 65.2                                   | 64.9                                   |
| 31500.0                                | 67.4                                  | 65.9                                  | 65.6                                  | 64.1                                   | 64.4                                   | 63.9                                   |
| 40000.0                                | 67.9                                  | 65.7                                  | 65.1                                  | 63.5                                   | 64.3                                   | 63.1                                   |
| OVERALL<br>SPL                         | 81.7                                  | 81.0                                  | 80.1                                  | 79.7                                   | 79.7                                   | 79.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.78 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 59.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 203

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.196  
TEMPERATURE RATIO TR = 0.998  
MACH NUMBER MJ = 0.512  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.948  
JET DENSITY RATIO DJ/D0 = 1.055  
JET VELOCITY RATIO VJ/A0 = 0.499  
JET VELOCITY VJ = 557.6 FPS

TR/TJ = 1.052  
DR/D0 = 1.198  
DR/DJ = 1.136  
MASS FLOW = 0.963 POUNDS PER SECOND  
THRUST = 16.91 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 52.5                                   | 54.4                                   | 55.4                                   | 54.2                                    | 54.2                                    | 54.8                                    |
| 250.0                                  | 55.0                                   | 56.0                                   | 55.2                                   | 54.5                                    | 54.4                                    | 54.1                                    |
| 315.2                                  | 56.1                                   | 56.5                                   | 56.9                                   | 56.2                                    | 56.3                                    | 55.7                                    |
| 400.0                                  | 58.9                                   | 58.9                                   | 58.9                                   | 57.9                                    | 58.7                                    | 57.8                                    |
| 500.0                                  | 60.8                                   | 60.4                                   | 60.8                                   | 60.5                                    | 60.2                                    | 59.5                                    |
| 630.0                                  | 62.7                                   | 62.2                                   | 62.1                                   | 61.7                                    | 60.8                                    | 60.4                                    |
| 800.0                                  | 64.0                                   | 64.2                                   | 63.6                                   | 62.6                                    | 62.0                                    | 61.6                                    |
| 1000.0                                 | 65.7                                   | 65.0                                   | 64.0                                   | 63.8                                    | 62.9                                    | 62.3                                    |
| 1250.0                                 | 66.9                                   | 66.2                                   | 65.4                                   | 64.8                                    | 64.4                                    | 63.6                                    |
| 1600.0                                 | 67.2                                   | 66.2                                   | 65.9                                   | 65.0                                    | 64.8                                    | 64.0                                    |
| 2000.0                                 | 68.0                                   | 67.3                                   | 66.7                                   | 66.2                                    | 65.6                                    | 65.0                                    |
| 2500.0                                 | 68.3                                   | 67.3                                   | 67.0                                   | 66.7                                    | 66.5                                    | 65.7                                    |
| 3150.0                                 | 68.7                                   | 67.8                                   | 67.7                                   | 67.4                                    | 67.2                                    | 66.4                                    |
| 4000.0                                 | 68.8                                   | 68.3                                   | 68.1                                   | 67.7                                    | 67.5                                    | 66.5                                    |
| 5000.0                                 | 68.6                                   | 68.6                                   | 68.4                                   | 67.7                                    | 67.7                                    | 66.6                                    |
| 6300.0                                 | 68.8                                   | 68.7                                   | 68.4                                   | 67.8                                    | 68.2                                    | 67.3                                    |
| 8000.0                                 | 68.8                                   | 69.2                                   | 67.3                                   | 67.4                                    | 67.1                                    | 66.4                                    |
| 10000.0                                | 69.3                                   | 68.7                                   | 67.1                                   | 67.0                                    | 66.7                                    | 65.5                                    |
| 12500.0                                | 69.1                                   | 67.1                                   | 67.1                                   | 66.8                                    | 66.5                                    | 65.6                                    |
| 16000.0                                | 67.7                                   | 67.3                                   | 65.8                                   | 66.2                                    | 65.9                                    | 65.0                                    |
| 20000.0                                | 66.3                                   | 67.1                                   | 65.7                                   | 65.5                                    | 65.0                                    | 64.7                                    |
| 25000.0                                | 67.3                                   | 66.0                                   | 65.5                                   | 65.1                                    | 64.6                                    | 64.8                                    |
| 31500.0                                | 67.0                                   | 66.3                                   | 65.4                                   | 64.8                                    | 64.5                                    | 65.1                                    |
| 40000.0                                | 66.5                                   | 66.6                                   | 65.6                                   | 65.4                                    | 64.1                                    | 65.8                                    |
| OVERALL<br>SPL                         | 80.5                                   | 80.0                                   | 79.4                                   | 79.0                                    | 78.7                                    | 78.1                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 55.3                                    | 57.0                                    | 54.1                                    | 54.9                                    |
| 250.0                                  | 54.5                                    | 54.8                                    | 55.0                                    | 55.0                                    |
| 315.2                                  | 56.1                                    | 56.2                                    | 55.2                                    | 55.6                                    |
| 400.0                                  | 58.6                                    | 56.8                                    | 55.8                                    | 57.5                                    |
| 500.0                                  | 59.3                                    | 58.2                                    | 57.1                                    | 57.0                                    |
| 630.0                                  | 60.1                                    | 58.9                                    | 57.4                                    | 57.1                                    |
| 800.0                                  | 60.8                                    | 59.9                                    | 58.6                                    | 58.1                                    |
| 1000.0                                 | 61.8                                    | 60.3                                    | 59.3                                    | 58.0                                    |
| 1250.0                                 | 62.9                                    | 61.6                                    | 60.4                                    | 58.1                                    |
| 1600.0                                 | 63.4                                    | 61.9                                    | 60.4                                    | 59.0                                    |
| 2000.0                                 | 64.6                                    | 63.1                                    | 61.7                                    | 59.9                                    |
| 2500.0                                 | 65.5                                    | 64.0                                    | 62.3                                    | 60.4                                    |
| 3150.0                                 | 66.2                                    | 64.8                                    | 62.9                                    | 61.2                                    |
| 4000.0                                 | 66.6                                    | 64.9                                    | 63.2                                    | 60.9                                    |
| 5000.0                                 | 66.6                                    | 64.7                                    | 62.7                                    | 60.5                                    |
| 6300.0                                 | 66.7                                    | 64.7                                    | 62.6                                    | 61.0                                    |
| 8000.0                                 | 66.5                                    | 64.7                                    | 61.9                                    | 60.0                                    |
| 10000.0                                | 65.7                                    | 63.7                                    | 61.5                                    | 60.0                                    |
| 12500.0                                | 65.8                                    | 63.6                                    | 60.7                                    | 58.7                                    |
| 16000.0                                | 65.3                                    | 63.1                                    | 60.5                                    | 57.9                                    |
| 20000.0                                | 64.8                                    | 62.4                                    | 59.9                                    | 57.0                                    |
| 25000.0                                | 64.3                                    | 62.0                                    | 59.6                                    | 56.2                                    |
| 31500.0                                | 64.2                                    | 61.9                                    | 59.4                                    | 55.8                                    |
| 40000.0                                | 64.4                                    | 62.3                                    | 59.3                                    | 55.5                                    |
| OVERALL<br>SPL                         | 77.9                                    | 76.1                                    | 74.1                                    | 72.4                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.21 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 68.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 22

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.297$   
TEMPERATURE RATIO  $TR = 0.992$   
MACH NUMBER  $MJ = 0.621$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 0.921$   
JET DENSITY RATIO  $DJ/DO = 1.085$   
JET VELOCITY RATIO  $VJ/AO = 0.596$   
JET VELOCITY  $VJ = 673.9$  FPS

$TR/TJ = 1.077$   
 $OR/DO = 1.307$   
 $OR/DJ = 1.204$   
MASS FLOW = 1.184 POUNDS PER SECOND  
THRUST = 24.85 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 74.1                                  | 78.8                                  | 68.9                                  | 62.4                                  | 61.9                                  | 60.1                                  |
| 250.0                                  | 75.6                                  | 78.6                                  | 70.8                                  | 66.2                                  | 64.7                                  | 62.4                                  |
| 315.2                                  | 77.5                                  | 78.3                                  | 73.4                                  | 68.1                                  | 67.3                                  | 64.6                                  |
| 400.0                                  | 78.8                                  | 80.0                                  | 73.6                                  | 71.0                                  | 69.6                                  | 66.8                                  |
| 500.0                                  | 80.4                                  | 79.3                                  | 76.2                                  | 72.4                                  | 71.0                                  | 68.7                                  |
| 630.0                                  | 80.1                                  | 80.0                                  | 77.7                                  | 74.1                                  | 73.2                                  | 70.6                                  |
| 800.0                                  | 82.5                                  | 81.6                                  | 78.8                                  | 75.9                                  | 74.9                                  | 71.8                                  |
| 1000.0                                 | 81.0                                  | 81.0                                  | 79.5                                  | 76.9                                  | 75.9                                  | 73.6                                  |
| 1250.0                                 | 80.2                                  | 81.4                                  | 80.6                                  | 78.3                                  | 77.7                                  | 75.0                                  |
| 1600.0                                 | 78.6                                  | 80.7                                  | 80.1                                  | 78.6                                  | 78.1                                  | 75.7                                  |
| 2000.0                                 | 76.7                                  | 79.9                                  | 7.9                                   | 78.8                                  | 78.7                                  | 76.6                                  |
| 2500.0                                 | 75.1                                  | 78.5                                  | 79.2                                  | 78.5                                  | 78.6                                  | 76.7                                  |
| 3150.0                                 | 73.5                                  | 77.4                                  | 78.4                                  | 78.5                                  | 78.7                                  | 76.8                                  |
| 4000.0                                 | 74.4                                  | 76.7                                  | 77.5                                  | 78.1                                  | 79.3                                  | 76.9                                  |
| 5000.0                                 | 73.5                                  | 75.7                                  | 76.1                                  | 77.1                                  | 78.8                                  | 77.1                                  |
| 6300.0                                 | 73.8                                  | 74.6                                  | 74.8                                  | 76.7                                  | 78.4                                  | 77.2                                  |
| 8000.0                                 | 73.6                                  | 73.3                                  | 73.0                                  | 75.7                                  | 77.9                                  | 76.5                                  |
| 10000.0                                | 73.4                                  | 72.1                                  | 71.5                                  | 74.6                                  | 77.4                                  | 76.5                                  |
| 12500.0                                | 72.0                                  | 71.9                                  | 69.9                                  | 74.0                                  | 77.2                                  | 76.4                                  |
| 16000.0                                | 68.7                                  | 70.3                                  | 67.5                                  | 72.7                                  | 76.2                                  | 75.7                                  |
| 20000.0                                | 65.3                                  | 68.2                                  | 64.9                                  | 71.4                                  | 75.1                                  | 75.2                                  |
| 25000.0                                | 64.4                                  | 67.9                                  | 63.3                                  | 70.4                                  | 74.2                                  | 74.9                                  |
| 31500.0                                | 63.8                                  | 68.1                                  | 61.8                                  | 69.3                                  | 73.4                                  | 74.6                                  |
| 40000.0                                | 63.2                                  | 69.8                                  | 61.5                                  | 69.1                                  | 72.9                                  | 74.9                                  |
| OVERALL<br>SPL                         | 90.6                                  | 91.6                                  | 89.9                                  | 89.2                                  | 90.0                                  | 88.6                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 58.8                                  | 60.1                                  | 59.5                                  | 59.5                                   | 59.4                                   | 59.7                                   |
| 250.0                                  | 61.9                                  | 61.7                                  | 61.3                                  | 60.4                                   | 60.3                                   | 59.7                                   |
| 315.2                                  | 64.1                                  | 64.0                                  | 63.4                                  | 62.6                                   | 62.2                                   | 62.3                                   |
| 400.0                                  | 66.0                                  | 65.8                                  | 64.6                                  | 64.0                                   | 63.8                                   | 63.4                                   |
| 500.0                                  | 67.9                                  | 67.3                                  | 66.3                                  | 66.2                                   | 65.9                                   | 65.0                                   |
| 630.0                                  | 69.2                                  | 69.3                                  | 68.1                                  | 67.8                                   | 67.5                                   | 66.9                                   |
| 800.0                                  | 70.7                                  | 70.7                                  | 69.5                                  | 69.3                                   | 68.7                                   | 68.4                                   |
| 1000.0                                 | 72.1                                  | 71.9                                  | 70.9                                  | 70.1                                   | 69.9                                   | 69.3                                   |
| 1250.0                                 | 73.6                                  | 73.2                                  | 72.3                                  | 71.7                                   | 71.5                                   | 70.9                                   |
| 1600.0                                 | 74.4                                  | 74.0                                  | 72.6                                  | 72.1                                   | 72.2                                   | 71.4                                   |
| 2000.0                                 | 75.2                                  | 74.7                                  | 73.5                                  | 73.0                                   | 73.2                                   | 72.0                                   |
| 2500.0                                 | 75.6                                  | 75.3                                  | 73.8                                  | 73.6                                   | 73.5                                   | 72.8                                   |
| 3150.0                                 | 76.0                                  | 75.7                                  | 74.3                                  | 74.2                                   | 74.1                                   | 73.5                                   |
| 4000.0                                 | 76.3                                  | 76.2                                  | 74.9                                  | 74.6                                   | 74.7                                   | 74.0                                   |
| 5000.0                                 | 76.4                                  | 76.1                                  | 74.7                                  | 74.9                                   | 74.9                                   | 74.3                                   |
| 6300.0                                 | 76.7                                  | 76.2                                  | 74.8                                  | 75.0                                   | 75.0                                   | 74.7                                   |
| 8000.0                                 | 76.3                                  | 76.1                                  | 74.7                                  | 74.5                                   | 74.8                                   | 74.6                                   |
| 10000.0                                | 76.3                                  | 76.0                                  | 74.2                                  | 74.4                                   | 74.5                                   | 74.9                                   |
| 12500.0                                | 76.3                                  | 75.7                                  | 74.2                                  | 74.1                                   | 74.1                                   | 74.3                                   |
| 16000.0                                | 75.6                                  | 74.9                                  | 73.8                                  | 73.3                                   | 73.5                                   | 73.5                                   |
| 20000.0                                | 75.3                                  | 74.0                                  | 73.2                                  | 72.4                                   | 72.6                                   | 72.2                                   |
| 25000.0                                | 75.0                                  | 73.2                                  | 72.8                                  | 71.8                                   | 72.0                                   | 71.2                                   |
| 31500.0                                | 74.8                                  | 72.3                                  | 72.2                                  | 71.1                                   | 71.4                                   | 70.3                                   |
| 40000.0                                | 75.6                                  | 72.2                                  | 71.7                                  | 70.9                                   | 71.5                                   | 69.7                                   |
| OVERALL<br>SPL                         | 88.1                                  | 87.4                                  | 86.2                                  | 85.9                                   | 85.9                                   | 85.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.21 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 58.00 DEG.F, CHAMBER TEMPERATURE = 59.00 DEG.F  
RELATIVE HUMIDITY = 53.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 204

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.297$   
TEMPERATURE RATIO  $TR = 0.998$   
MACH NUMBER  $MJ = 0.621$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.927$   
JET DENSITY RATIO  $DJ/D_0 = 1.079$   
JET VELOCITY RATIO  $VJ/A_0 = 0.598$   
JET VELOCITY  $VJ = 667.5$  FPS

$TR/TJ = 1.077$   
 $DR/D_0 = 1.299$   
 $DR/DJ = 1.204$   
MASS FLOW = 1.181 POUNDS PER SECOND  
THRUST = 24.85 POUNDS

SHOCK CELL LENGTH  $s = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
|         | 13    | 105.0 | 14    | 112.5 | 15    | 120.0 |
| 200.0   | 56.2  |       | 58.1  |       | 59.0  | 58.0  |
| 250.0   | 59.7  |       | 60.0  |       | 59.4  | 58.6  |
| 315.2   | 60.5  |       | 61.4  |       | 61.3  | 60.6  |
| 400.0   | 63.2  |       | 63.7  |       | 62.6  | 62.5  |
| 500.0   | 64.8  |       | 64.7  |       | 64.8  | 64.9  |
| 630.0   | 66.9  |       | 67.0  |       | 67.0  | 66.5  |
| 800.0   | 69.2  |       | 69.0  |       | 68.5  | 67.4  |
| 1000.0  | 70.2  |       | 70.0  |       | 69.0  | 68.5  |
| 1250.0  | 72.0  |       | 71.0  |       | 70.4  | 70.0  |
| 1600.0  | 72.5  |       | 71.6  |       | 70.9  | 70.3  |
| 2000.0  | 73.2  |       | 72.5  |       | 71.9  | 71.3  |
| 2500.0  | 73.4  |       | 72.7  |       | 72.1  | 71.8  |
| 3150.0  | 74.1  |       | 73.1  |       | 73.0  | 72.6  |
| 4000.0  | 74.1  |       | 73.7  |       | 73.3  | 72.8  |
| 5000.0  | 74.1  |       | 74.2  |       | 73.6  | 72.8  |
| 6300.0  | 74.0  |       | 74.6  |       | 73.9  | 73.0  |
| 8000.0  | 74.3  |       | 74.9  |       | 72.6  | 72.8  |
| 10000.0 | 74.5  |       | 74.5  |       | 72.7  | 72.4  |
| 12500.0 | 74.9  |       | 72.9  |       | 72.6  | 72.1  |
| 16000.0 | 73.5  |       | 73.2  |       | 71.3  | 71.5  |
| 20000.0 | 72.2  |       | 73.0  |       | 71.3  | 70.8  |
| 25000.0 | 73.0  |       | 71.8  |       | 70.9  | 70.5  |
| 31500.0 | 72.7  |       | 72.2  |       | 70.7  | 70.3  |
| 40000.0 | 72.2  |       | 72.4  |       | 70.6  | 70.7  |
|         |       |       |       |       |       | 69.6  |
| OVERALL |       |       |       |       |       |       |
| SPL     | 85.9  |       | 85.6  |       | 84.6  | 84.2  |
|         |       |       |       |       |       | 84.0  |
|         |       |       |       |       |       | 83.9  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 57.5                        | 58.8                        | 57.4                        | 58.2                        |
| 250.0                                  | 59.3                        | 59.8                        | 60.0                        | 59.8                        |
| 315.2                                  | 60.7                        | 60.5                        | 59.4                        | 59.2                        |
| 400.0                                  | 62.4                        | 61.3                        | 60.5                        | 61.3                        |
| 500.0                                  | 64.2                        | 63.2                        | 62.1                        | 61.7                        |
| 630.0                                  | 65.4                        | 64.1                        | 62.8                        | 62.0                        |
| 800.0                                  | 66.3                        | 65.0                        | 63.9                        | 63.0                        |
| 1000.0                                 | 67.2                        | 65.7                        | 64.3                        | 63.6                        |
| 1250.0                                 | 68.5                        | 66.8                        | 65.7                        | 64.1                        |
| 1600.0                                 | 69.0                        | 67.4                        | 66.1                        | 65.1                        |
| 2000.0                                 | 70.2                        | 68.8                        | 67.9                        | 65.9                        |
| 2500.0                                 | 71.2                        | 69.8                        | 68.5                        | 67.0                        |
| 3150.0                                 | 71.9                        | 70.6                        | 69.2                        | 67.6                        |
| 4000.0                                 | 72.3                        | 70.6                        | 69.4                        | 67.3                        |
| 5000.0                                 | 72.6                        | 70.6                        | 69.3                        | 67.4                        |
| 6300.0                                 | 72.6                        | 71.8                        | 69.3                        | 67.8                        |
| 8000.0                                 | 72.6                        | 70.8                        | 68.5                        | 66.8                        |
| 10000.0                                | 72.1                        | 71.0                        | 68.6                        | 67.0                        |
| 12500.0                                | 72.1                        | 69.9                        | 67.2                        | 65.3                        |
| 16000.0                                | 71.7                        | 69.3                        | 66.8                        | 64.0                        |
| 20000.0                                | 71.1                        | 68.5                        | 66.1                        | 63.1                        |
| 25000.0                                | 70.8                        | 68.0                        | 65.8                        | 62.2                        |
| 31500.0                                | 70.6                        | 67.9                        | 65.6                        | 61.7                        |
| 40000.0                                | 70.9                        | 68.4                        | 65.6                        | 61.2                        |
| OVERALL<br>SPL                         | 83.8                        | 82.1                        | 80.3                        | 78.5                        |



SUPERSONIC JET EXHAUST NOISE

MAC<sup>1</sup> 1.0 NOZZLE

RESERVOIR PRESSURE = 6.24 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 68.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 23

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.440  
TEMPERATURE RATIO TR = 0.992  
MACH NUMBER MJ = 0.741  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.894  
JET DENSITY RATIO DJ/D0 = 1.118  
JET VELOCITY RATIO VJ/A0 = 0.701  
JET VELOCITY VJ = 792.3 FPS

TR/TJ = 1.110  
DR/D0 = 1.451  
DR/DJ = 1.298  
MASS FLOW = 1.435 POUNDS PER SECOND  
THRUST = 35.39 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 80.3                                  | 80.9                                  | 74.5                                  | 67.6                                  | 67.1                                  | 64.4                                  |
| 250.0                                  | 80.3                                  | 80.7                                  | 75.5                                  | 70.6                                  | 69.6                                  | 67.4                                  |
| 315.2                                  | 81.9                                  | 80.9                                  | 78.3                                  | 73.4                                  | 72.1                                  | 70.1                                  |
| 400.0                                  | 84.0                                  | 83.9                                  | 79.4                                  | 76.5                                  | 74.1                                  | 72.6                                  |
| 500.0                                  | 86.3                                  | 83.8                                  | 82.1                                  | 77.7                                  | 77.0                                  | 74.2                                  |
| 630.0                                  | 86.1                                  | 86.1                                  | 84.5                                  | 80.4                                  | 78.7                                  | 76.2                                  |
| 800.0                                  | 88.5                                  | 87.6                                  | 85.9                                  | 82.0                                  | 80.3                                  | 77.7                                  |
| 1000.0                                 | 87.1                                  | 87.4                                  | 86.6                                  | 83.1                                  | 81.7                                  | 79.6                                  |
| 1250.0                                 | 86.4                                  | 87.8                                  | 87.6                                  | 84.5                                  | 83.3                                  | 80.8                                  |
| 1600.0                                 | 84.2                                  | 86.4                                  | 87.0                                  | 84.9                                  | 83.8                                  | 81.8                                  |
| 2000.0                                 | 82.5                                  | 85.6                                  | 86.8                                  | 85.3                                  | 84.5                                  | 82.6                                  |
| 2500.0                                 | 80.6                                  | 83.8                                  | 86.0                                  | 85.0                                  | 84.6                                  | 83.0                                  |
| 3150.0                                 | 78.8                                  | 82.6                                  | 85.0                                  | 85.0                                  | 84.8                                  | 83.1                                  |
| 4000.0                                 | 79.4                                  | 81.7                                  | 84.0                                  | 84.7                                  | 85.2                                  | 83.4                                  |
| 5000.0                                 | 78.0                                  | 80.4                                  | 82.7                                  | 83.4                                  | 84.7                                  | 83.4                                  |
| 6300.0                                 | 78.5                                  | 79.8                                  | 81.8                                  | 82.9                                  | 84.3                                  | 83.5                                  |
| 8000.0                                 | 77.7                                  | 78.6                                  | 80.4                                  | 82.1                                  | 83.6                                  | 83.0                                  |
| 10000.0                                | 79.0                                  | 77.7                                  | 79.5                                  | 80.1                                  | 83.1                                  | 82.9                                  |
| 12500.0                                | 76.7                                  | 77.0                                  | 78.0                                  | 80.6                                  | 82.8                                  | 82.8                                  |
| 16000.0                                | 73.8                                  | 75.3                                  | 76.2                                  | 79.5                                  | 81.9                                  | 82.1                                  |
| 20000.0                                | 70.6                                  | 73.5                                  | 74.3                                  | 78.3                                  | 80.6                                  | 81.5                                  |
| 25000.0                                | 69.0                                  | 73.5                                  | 72.7                                  | 77.1                                  | 79.8                                  | 81.2                                  |
| 31500.0                                | 68.8                                  | 74.6                                  | 70.7                                  | 75.8                                  | 78.8                                  | 80.9                                  |
| 40000.0                                | 69.0                                  | 77.8                                  | 69.0                                  | 75.4                                  | 78.0                                  | 80.5                                  |
| OVERALL<br>SPL                         | 96.2                                  | 96.9                                  | 96.8                                  | 95.5                                  | 95.8                                  | 94.8                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  |
|         | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
| 200.0   | 63.4  |       | 65.0  |       | 64.5  |       |
| 250.0   | 66.2  |       | 65.8  |       | 64.5  |       |
| 315.2   | 69.0  |       | 68.4  |       | 65.7  |       |
| 400.0   | 71.2  |       | 70.6  |       | 67.6  |       |
| 500.0   | 73.0  |       | 71.7  |       | 69.2  |       |
| 630.0   | 74.6  |       | 74.0  |       | 70.9  |       |
| 800.0   | 76.6  |       | 75.7  |       | 70.2  |       |
| 1000.0  | 78.4  |       | 77.0  |       | 72.6  |       |
| 1250.0  | 79.7  |       | 79.0  |       | 74.2  |       |
| 1600.0  | 80.2  |       | 79.5  |       | 74.1  |       |
| 2000.0  | 81.4  |       | 80.6  |       | 75.3  |       |
| 2500.0  | 81.7  |       | 81.1  |       | 76.9  |       |
| 3150.0  | 82.1  |       | 81.4  |       | 77.4  |       |
| 4000.0  | 82.4  |       | 82.0  |       | 77.8  |       |
| 5000.0  | 82.6  |       | 82.2  |       | 78.6  |       |
| 6300.0  | 82.9  |       | 82.5  |       | 78.2  |       |
| 8000.0  | 82.5  |       | 82.1  |       | 79.4  |       |
| 10000.0 | 82.4  |       | 82.2  |       | 79.1  |       |
| 12500.0 | 82.3  |       | 82.0  |       | 79.8  |       |
| 16000.0 | 81.7  |       | 81.4  |       | 79.6  |       |
| 20000.0 | 81.2  |       | 80.8  |       | 80.1  |       |
| 25000.0 | 80.7  |       | 80.3  |       | 80.4  |       |
| 31500.0 | 79.8  |       | 79.6  |       | 80.4  |       |
| 40000.0 | 79.3  |       | 79.6  |       | 80.2  |       |
|         |       |       |       |       | 80.5  |       |
|         |       |       |       |       | 80.8  |       |
|         |       |       |       |       | 80.2  |       |
|         |       |       |       |       | 80.6  |       |
|         |       |       |       |       | 80.6  |       |
|         |       |       |       |       | 79.9  |       |
|         |       |       |       |       | 80.2  |       |
|         |       |       |       |       | 79.7  |       |
|         |       |       |       |       | 79.0  |       |
|         |       |       |       |       | 78.2  |       |
|         |       |       |       |       | 79.0  |       |
|         |       |       |       |       | 78.5  |       |
|         |       |       |       |       | 77.5  |       |
|         |       |       |       |       | 76.7  |       |
|         |       |       |       |       | 78.0  |       |
|         |       |       |       |       | 77.1  |       |
|         |       |       |       |       | 75.9  |       |
|         |       |       |       |       | 77.9  |       |
|         |       |       |       |       | 76.5  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 94.0  |       | 93.5  |       | 91.5  |       |
|         |       |       |       |       | 91.7  |       |
|         |       |       |       |       | 91.4  |       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 6.24 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 55.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 205

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.440  
TEMPERATURE RATIO TR = 0.996  
MACH NUMBER MJ = 0.741  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.898  
JET DENSITY RATIO DJ/D0 = 1.114  
JET VELOCITY RATIO VJ/A0 = 0.702  
JET VELOCITY VJ = 782.5 FPS

TR/TJ = 1.110  
DR/D0 = 1.446  
DR/CJ = 1.298  
MASS FLOW = 1.432 POUNDS PER SECOND  
THRUST = 35.39 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 59.9                        | 62.8                        | 62.8                        | 62.3                        | 61.4                        | 60.7                        |
| 250.0                                  | 63.5                        | 63.8                        | 63.3                        | 62.2                        | 62.3                        | 61.6                        |
| 315.2                                  | 64.7                        | 65.3                        | 64.6                        | 65.0                        | 63.8                        | 63.4                        |
| 400.0                                  | 67.2                        | 67.5                        | 66.8                        | 66.8                        | 66.4                        | 66.6                        |
| 500.0                                  | 69.6                        | 69.6                        | 69.7                        | 69.5                        | 68.6                        | 68.3                        |
| 630.0                                  | 71.7                        | 71.2                        | 71.9                        | 71.0                        | 70.1                        | 70.0                        |
| 800.0                                  | 73.4                        | 73.4                        | 73.2                        | 72.1                        | 71.5                        | 71.0                        |
| 1000.0                                 | 75.2                        | 74.8                        | 73.8                        | 73.4                        | 72.4                        | 71.7                        |
| 1250.0                                 | 77.0                        | 76.0                        | 75.6                        | 74.8                        | 74.3                        | 73.5                        |
| 1600.0                                 | 77.5                        | 76.3                        | 76.0                        | 75.4                        | 74.8                        | 74.1                        |
| 2000.0                                 | 78.5                        | 77.5                        | 77.1                        | 76.4                        | 75.7                        | 75.3                        |
| 2500.0                                 | 78.8                        | 78.1                        | 77.6                        | 77.2                        | 76.8                        | 76.3                        |
| 3150.0                                 | 79.2                        | 78.8                        | 78.4                        | 78.1                        | 77.5                        | 77.0                        |
| 4000.0                                 | 79.3                        | 78.9                        | 78.7                        | 78.0                        | 77.5                        | 76.9                        |
| 5000.0                                 | 79.1                        | 79.3                        | 78.9                        | 78.0                        | 77.8                        | 76.9                        |
| 6300.0                                 | 79.5                        | 80.0                        | 79.0                        | 78.6                        | 78.3                        | 78.0                        |
| 8000.0                                 | 79.6                        | 80.3                        | 77.9                        | 78.1                        | 77.9                        | 77.0                        |
| 10000.0                                | 80.4                        | 80.0                        | 78.0                        | 77.8                        | 78.0                        | 77.3                        |
| 12500.0                                | 80.1                        | 78.7                        | 78.0                        | 77.5                        | 77.4                        | 76.5                        |
| 16000.0                                | 78.5                        | 78.6                        | 76.8                        | 76.9                        | 76.7                        | 75.9                        |
| 20000.0                                | 77.3                        | 78.5                        | 76.6                        | 76.3                        | 76.0                        | 75.4                        |
| 25000.0                                | 78.3                        | 77.4                        | 76.6                        | 75.8                        | 75.6                        | 75.1                        |
| 31500.0                                | 77.8                        | 77.7                        | 76.5                        | 75.6                        | 75.3                        | 75.2                        |
| 40000.0                                | 77.4                        | 77.9                        | 76.5                        | 76.1                        | 74.8                        | 75.8                        |
| OVERALL<br>SPL                         | 91.1                        | 90.9                        | 89.9                        | 89.5                        | 89.1                        | 88.5                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO | MICRO |       | MICRO |       | MICRO |       | MICRO |       |       |
| CENTER  | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |       |       |
| 200.0   | 60.1  |       | 60.9  |       | 60.4  |       | 61.2  |       |       |       |
| 250.0   | 61.6  |       | 62.0  |       | 62.6  |       | 62.8  |       |       |       |
| 315.2   | 63.7  |       | 63.3  |       | 62.4  |       | 62.4  |       |       |       |
| 400.0   | 66.1  |       | 64.6  |       | 63.9  |       | 64.1  |       |       |       |
| 500.0   | 67.6  |       | 66.5  |       | 65.4  |       | 64.7  |       |       |       |
| 630.0   | 69.2  |       | 68.3  |       | 66.7  |       | 65.7  |       |       |       |
| 800.0   | 70.2  |       | 69.0  |       | 68.0  |       | 66.7  |       |       |       |
| 1000.0  | 71.3  |       | 69.8  |       | 68.8  |       | 67.2  |       |       |       |
| 1250.0  | 72.6  |       | 71.4  |       | 70.1  |       | 68.1  |       |       |       |
| 1600.0  | 73.4  |       | 72.1  |       | 70.9  |       | 69.8  |       |       |       |
| 2000.0  | 74.8  |       | 73.6  |       | 72.6  |       | 71.0  |       |       |       |
| 2500.0  | 76.1  |       | 74.8  |       | 73.6  |       | 72.1  |       |       |       |
| 3150.0  | 76.5  |       | 75.5  |       | 74.2  |       | 72.7  |       |       |       |
| 4000.0  | 76.8  |       | 75.7  |       | 74.6  |       | 72.7  |       |       |       |
| 5000.0  | 76.9  |       | 75.5  |       | 74.2  |       | 72.4  |       |       |       |
| 6300.0  | 77.7  |       | 76.2  |       | 74.8  |       | 72.7  |       |       |       |
| 8000.0  | 77.3  |       | 76.2  |       | 73.8  |       | 72.1  |       |       |       |
| 10000.0 | 77.0  |       | 75.7  |       | 73.4  |       | 71.4  |       |       |       |
| 12500.0 | 76.8  |       | 75.1  |       | 72.6  |       | 70.7  |       |       |       |
| 16000.0 | 76.2  |       | 74.4  |       | 71.9  |       | 69.5  |       |       |       |
| 20000.0 | 75.4  |       | 73.7  |       | 71.2  |       | 68.4  |       |       |       |
| 25000.0 | 75.0  |       | 73.2  |       | 70.9  |       | 67.5  |       |       |       |
| 31500.0 | 74.8  |       | 73.1  |       | 70.8  |       | 66.9  |       |       |       |
| 40000.0 | 75.0  |       | 73.6  |       | 70.6  |       | 66.5  |       |       |       |
| OVERALL |       |       |       |       |       |       |       |       |       |       |
| SPL     | 88.3  |       | 87.0  |       | 85.2  |       | 83.3  |       |       |       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.75 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 68.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 24

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.617$   
TEMPERATURE RATIO  $TR = 0.992$   
MACH NUMBER  $MJ = 0.858$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 0.865$   
JET DENSITY RATIO  $DJ/D0 = 1.156$   
JET VELOCITY RATIO  $VJ/A0 = 0.798$   
JET VELOCITY  $VJ = 902.2$  FPS

$TR/TJ = 1.147$   
 $DR/D0 = 1.629$   
 $DR/DJ = 1.410$   
MASS FLOW = 1.689 POUNDS PER SECOND  
THRUST = 47.44 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      |
|-------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| FREQ.<br>HZ             | NO. 1<br>ANGLE 15.0 | NO. 2<br>ANGLE 22.5 | NO. 3<br>ANGLE 30.0 | NO. 4<br>ANGLE 37.5 | NO. 5<br>ANGLE 45.0 | NO. 6<br>ANGLE 52.5 |
| 200.0                   | 83.1                | 84.9                | 74.2                | 71.0                | 68.5                | 67.9                |
| 250.0                   | 83.7                | 85.0                | 78.4                | 75.0                | 72.5                | 70.1                |
| 315.2                   | 86.8                | 86.0                | 82.3                | 77.6                | 76.2                | 73.4                |
| 400.0                   | 88.3                | 89.0                | 83.8                | 80.9                | 78.3                | 76.3                |
| 500.0                   | 91.3                | 89.5                | 87.2                | 82.9                | 80.2                | 77.4                |
| 630.0                   | 91.5                | 91.3                | 89.5                | 85.4                | 83.0                | 80.4                |
| 800.0                   | 94.2                | 93.7                | 91.4                | 87.4                | 85.2                | 82.3                |
| 1000.0                  | 93.4                | 94.1                | 92.7                | 89.0                | 86.4                | 84.0                |
| 1250.0                  | 92.9                | 93.9                | 93.8                | 90.1                | 88.0                | 85.7                |
| 1600.0                  | 90.7                | 92.4                | 92.7                | 90.1                | 88.6                | 86.8                |
| 2000.0                  | 88.4                | 91.4                | 92.4                | 90.6                | 89.8                | 87.9                |
| 2500.0                  | 86.1                | 89.3                | 91.2                | 90.1                | 89.7                | 88.3                |
| 3150.0                  | 84.2                | 87.6                | 90.3                | 90.2                | 89.9                | 88.4                |
| 4000.0                  | 84.5                | 86.8                | 89.4                | 89.7                | 90.4                | 88.8                |
| 5000.0                  | 82.3                | 85.4                | 88.0                | 88.6                | 90.0                | 88.8                |
| 6300.0                  | 82.5                | 84.6                | 86.8                | 88.0                | 89.6                | 88.8                |
| 8000.0                  | 82.8                | 83.5                | 85.2                | 87.0                | 89.0                | 88.5                |
| 10000.0                 | 84.2                | 82.4                | 84.1                | 86.3                | 88.6                | 88.4                |
| 12500.0                 | 81.5                | 81.4                | 82.6                | 85.5                | 88.1                | 88.0                |
| 16000.0                 | 78.9                | 80.1                | 80.9                | 84.3                | 86.9                | 87.2                |
| 20000.0                 | 75.8                | 78.0                | 79.2                | 82.9                | 85.7                | 86.7                |
| 25000.0                 | 74.3                | 77.1                | 77.6                | 81.7                | 84.8                | 86.2                |
| 31500.0                 | 73.5                | 77.1                | 75.4                | 80.2                | 83.7                | 85.8                |
| 40000.0                 | 72.6                | 78.6                | 73.4                | 79.6                | 82.8                | 85.4                |
| OVERALL<br>SPL          | 101.8               | 102.5               | 102.2               | 100.7               | 100.9               | 100.0               |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 67.0                                  | 67.5                                  | 67.2                                  | 66.9                                   | 66.4                                   | 65.6                                   |
| 250.0                                  | 70.2                                  | 69.3                                  | 69.3                                  | 69.2                                   | 68.8                                   | 68.3                                   |
| 315.2                                  | 72.0                                  | 71.3                                  | 71.2                                  | 70.8                                   | 70.8                                   | 70.1                                   |
| 400.0                                  | 75.2                                  | 74.8                                  | 72.9                                  | 72.4                                   | 72.8                                   | 71.9                                   |
| 500.0                                  | 76.3                                  | 75.5                                  | 74.4                                  | 73.5                                   | 73.5                                   | 73.3                                   |
| 630.0                                  | 78.5                                  | 77.3                                  | 77.0                                  | 76.6                                   | 76.3                                   | 75.8                                   |
| 800.0                                  | 80.5                                  | 80.0                                  | 78.8                                  | 77.8                                   | 77.4                                   | 77.0                                   |
| 1000.0                                 | 82.1                                  | 81.3                                  | 79.9                                  | 79.4                                   | 78.8                                   | 78.1                                   |
| 1250.0                                 | 83.8                                  | 82.6                                  | 81.5                                  | 80.8                                   | 80.5                                   | 79.8                                   |
| 1600.0                                 | 85.0                                  | 83.5                                  | 82.2                                  | 81.7                                   | 81.4                                   | 80.6                                   |
| 2000.0                                 | 85.9                                  | 84.6                                  | 83.5                                  | 82.7                                   | 82.3                                   | 81.7                                   |
| 2500.0                                 | 86.4                                  | 85.3                                  | 83.9                                  | 83.3                                   | 83.0                                   | 82.5                                   |
| 3150.0                                 | 86.7                                  | 85.6                                  | 84.4                                  | 83.8                                   | 83.3                                   | 83.0                                   |
| 4000.0                                 | 87.2                                  | 86.1                                  | 85.1                                  | 84.4                                   | 84.1                                   | 83.6                                   |
| 5000.0                                 | 87.2                                  | 86.3                                  | 84.9                                  | 84.7                                   | 84.3                                   | 83.9                                   |
| 6300.0                                 | 87.6                                  | 86.6                                  | 85.3                                  | 84.9                                   | 84.5                                   | 84.5                                   |
| 8000.0                                 | 87.2                                  | 86.4                                  | 85.0                                  | 84.5                                   | 84.6                                   | 84.6                                   |
| 10000.0                                | 87.1                                  | 87.3                                  | 85.3                                  | 85.0                                   | 84.5                                   | 85.3                                   |
| 12500.0                                | 87.1                                  | 86.1                                  | 84.8                                  | 84.3                                   | 84.1                                   | 84.9                                   |
| 16000.0                                | 86.6                                  | 85.7                                  | 84.6                                  | 83.7                                   | 83.9                                   | 84.3                                   |
| 20000.0                                | 86.0                                  | 85.0                                  | 84.1                                  | 83.0                                   | 83.2                                   | 83.3                                   |
| 25000.0                                | 85.4                                  | 84.4                                  | 83.9                                  | 82.4                                   | 82.8                                   | 82.6                                   |
| 31500.0                                | 84.7                                  | 83.9                                  | 83.6                                  | 81.7                                   | 82.2                                   | 81.8                                   |
| 40000.0                                | 84.1                                  | 83.9                                  | 83.2                                  | 80.9                                   | 82.2                                   | 81.1                                   |
| OVERALL<br>SPL                         | 98.6                                  | 97.7                                  | 96.5                                  | 95.8                                   | 95.7                                   | 95.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.75 PSI, ATMOSPHERIC PRESSURE = 14.7 PSI  
RESERVOIR TEMPERATURE = 53.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 206

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.617  
TEMPERATURE RATIO TR = 0.992  
MACH NUMBER MJ = 0.858  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.865  
JET DENSITY RATIO DJ/D0 = 1.156  
JET VELOCITY RATIO VJ/A0 = 0.798  
JET VELOCITY VJ = 889.3 FPS

TR/TJ = 1.147  
DR/D0 = 1.630  
DR/DJ = 1.410  
MASS FLOW = 1.689 POUNDS PER SECOND  
THRUST = 47.44 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>120.0 |
|--|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 64.0                        |               | 66.2                        |               | 67.2                        |               | 66.4                        |                | 65.3                        |                | 63.6                        |                |
| 250.0                                  | 66.6                        |               | 67.4                        |               | 66.9                        |               | 65.8                        |                | 65.4                        |                | 64.5                        |                |
| 315.2                                  | 68.2                        |               | 68.9                        |               | 68.5                        |               | 68.2                        |                | 68.1                        |                | 66.8                        |                |
| 400.0                                  | 70.3                        |               | 71.0                        |               | 70.8                        |               | 70.4                        |                | 70.6                        |                | 70.4                        |                |
| 500.0                                  | 73.6                        |               | 73.1                        |               | 73.4                        |               | 73.3                        |                | 73.0                        |                | 71.7                        |                |
| 630.0                                  | 75.2                        |               | 74.9                        |               | 75.3                        |               | 75.2                        |                | 74.4                        |                | 73.7                        |                |
| 800.0                                  | 77.0                        |               | 77.4                        |               | 77.2                        |               | 76.1                        |                | 75.7                        |                | 74.6                        |                |
| 1000.0                                 | 79.2                        |               | 79.0                        |               | 78.4                        |               | 77.2                        |                | 76.7                        |                | 75.7                        |                |
| 1250.0                                 | 81.0                        |               | 80.6                        |               | 79.8                        |               | 79.3                        |                | 78.4                        |                | 77.7                        |                |
| 1600.0                                 | 81.9                        |               | 80.8                        |               | 80.2                        |               | 79.6                        |                | 79.3                        |                | 78.4                        |                |
| 2000.0                                 | 83.0                        |               | 82.0                        |               | 81.4                        |               | 80.5                        |                | 80.2                        |                | 79.5                        |                |
| 2500.0                                 | 83.4                        |               | 82.6                        |               | 82.0                        |               | 81.4                        |                | 81.2                        |                | 80.5                        |                |
| 3150.0                                 | 83.5                        |               | 83.0                        |               | 82.5                        |               | 82.0                        |                | 81.5                        |                | 80.7                        |                |
| 4000.0                                 | 83.9                        |               | 83.5                        |               | 83.2                        |               | 82.5                        |                | 82.0                        |                | 81.1                        |                |
| 5000.0                                 | 83.6                        |               | 83.6                        |               | 83.4                        |               | 82.1                        |                | 81.9                        |                | 80.9                        |                |
| 6300.0                                 | 83.2                        |               | 84.2                        |               | 83.2                        |               | 82.5                        |                | 82.3                        |                | 81.6                        |                |
| 8000.0                                 | 84.1                        |               | 85.0                        |               | 83.0                        |               | 82.4                        |                | 82.2                        |                | 81.4                        |                |
| 10000.0                                | 84.1                        |               | 84.1                        |               | 82.5                        |               | 82.1                        |                | 81.8                        |                | 81.0                        |                |
| 12500.0                                | 84.7                        |               | 83.4                        |               | 83.1                        |               | 82.0                        |                | 82.2                        |                | 81.1                        |                |
| 16000.0                                | 83.5                        |               | 83.2                        |               | 81.9                        |               | 81.5                        |                | 81.7                        |                | 80.7                        |                |
| 20000.0                                | 82.1                        |               | 83.3                        |               | 81.7                        |               | 80.9                        |                | 80.9                        |                | 80.5                        |                |
| 25000.0                                | 82.8                        |               | 82.2                        |               | 81.4                        |               | 80.8                        |                | 80.6                        |                | 80.2                        |                |
| 31500.0                                | 82.7                        |               | 82.5                        |               | 81.5                        |               | 80.7                        |                | 80.4                        |                | 80.1                        |                |
| 40000.0                                | 82.2                        |               | 82.6                        |               | 81.5                        |               | 81.1                        |                | 79.8                        |                | 80.4                        |                |
| OVERALL<br>SPL                         | 95.5                        |               | 95.4                        |               | 94.5                        |               | 93.8                        |                | 93.5                        |                | 92.8                        |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 62.8  |       | 63.4  |       |
| 250.0   | 64.9  |       | 64.7  |       |
| 315.2   | 67.1  |       | 66.5  |       |
| 400.0   | 69.8  |       | 68.5  |       |
| 500.0   | 71.7  |       | 70.4  |       |
| 630.0   | 73.7  |       | 72.4  |       |
| 800.0   | 74.2  |       | 72.7  |       |
| 1000.0  | 75.4  |       | 73.8  |       |
| 1250.0  | 77.1  |       | 75.9  |       |
| 1600.0  | 78.1  |       | 76.8  |       |
| 2000.0  | 79.3  |       | 78.7  |       |
| 2500.0  | 80.0  |       | 79.3  |       |
| 3150.0  | 80.5  |       | 79.9  |       |
| 4000.0  | 80.9  |       | 80.3  |       |
| 5000.0  | 81.1  |       | 80.4  |       |
| 6300.0  | 82.0  |       | 81.0  |       |
| 8000.0  | 81.8  |       | 81.4  |       |
| 10000.0 | 81.4  |       | 80.8  |       |
| 12500.0 | 81.6  |       | 80.9  |       |
| 16000.0 | 80.9  |       | 80.3  |       |
| 20000.0 | 80.5  |       | 79.7  |       |
| 25000.0 | 80.0  |       | 79.1  |       |
| 31500.0 | 79.7  |       | 78.7  |       |
| 40000.0 | 79.7  |       | 78.9  |       |
|         |       |       |       |       |
| OVERALL |       |       |       |       |
| SPL     | 92.8  |       | 92.0  |       |
|         |       |       | 90.5  |       |
|         |       |       |       | 88.5  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 12.10 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 68.00 DEG.F, CHAMBER TEMPERATURE = 71.00 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 25

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.853$   
TEMPERATURE RATIO  $TR = 0.994$   
MACH NUMBER  $MJ = 0.982$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 0.834$   
JET DENSITY RATIO  $DJ/D0 = 1.200$   
JET VELOCITY RATIO  $VJ/A0 = 0.896$   
JET VELOCITY  $VJ = 1012.5$  FPS

$TR/TJ = 1.193$   
 $DR/D0 = 1.864$   
 $DR/DJ = 1.554$   
MASS FLOW = 1.969 POUNDS PER SECOND  
THRUST = 62.13 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 1 15.0                      | 2 22.5                      | 3 30.0                      | 4 37.5                      | 5 45.0                      | 6 52.5                      |
| 200.0                                  | 88.8                        | 88.8                        | 76.5                        | 73.9                        | 72.7                        | 71.5                        |
| 250.0                                  | 88.4                        | 88.9                        | 81.5                        | 77.5                        | 76.1                        | 74.0                        |
| 315.2                                  | 90.5                        | 89.4                        | 86.5                        | 80.6                        | 78.7                        | 76.6                        |
| 400.0                                  | 93.0                        | 92.8                        | 88.1                        | 84.9                        | 81.9                        | 79.9                        |
| 500.0                                  | 95.8                        | 93.4                        | 91.5                        | 86.8                        | 84.4                        | 81.5                        |
| 630.0                                  | 95.6                        | 96.2                        | 94.5                        | 89.9                        | 86.9                        | 83.8                        |
| 800.0                                  | 98.9                        | 98.9                        | 96.7                        | 91.9                        | 88.8                        | 85.9                        |
| 1000.0                                 | 98.9                        | 99.4                        | 97.9                        | 93.7                        | 90.6                        | 87.8                        |
| 1250.0                                 | 98.5                        | 100.1                       | 99.4                        | 95.3                        | 92.3                        | 89.4                        |
| 1600.0                                 | 96.9                        | 99.4                        | 98.3                        | 95.4                        | 93.0                        | 90.7                        |
| 2000.0                                 | 94.7                        | 97.5                        | 97.6                        | 95.6                        | 94.1                        | 91.8                        |
| 2500.0                                 | 91.7                        | 94.8                        | 96.2                        | 95.1                        | 94.5                        | 92.3                        |
| 3150.0                                 | 89.3                        | 93.3                        | 94.8                        | 94.7                        | 94.5                        | 92.4                        |
| 4000.0                                 | 87.9                        | 91.6                        | 94.0                        | 94.1                        | 94.8                        | 92.7                        |
| 5000.0                                 | 86.4                        | 90.4                        | 92.5                        | 93.1                        | 94.3                        | 92.7                        |
| 6300.0                                 | 86.1                        | 89.3                        | 91.3                        | 92.3                        | 93.9                        | 92.7                        |
| 8000.0                                 | 85.5                        | 87.4                        | 90.0                        | 91.4                        | 93.2                        | 92.1                        |
| 10000.0                                | 85.0                        | 84.5                        | 87.1                        | 90.1                        | 92.7                        | 92.1                        |
| 12500.0                                | 83.7                        | 85.1                        | 87.9                        | 89.5                        | 92.1                        | 91.7                        |
| 16000.0                                | 81.4                        | 83.9                        | 86.6                        | 88.4                        | 90.8                        | 90.9                        |
| 20000.0                                | 78.4                        | 81.9                        | 85.4                        | 87.1                        | 89.5                        | 90.4                        |
| 25000.0                                | 76.9                        | 80.8                        | 84.4                        | 86.0                        | 88.6                        | 89.9                        |
| 31500.0                                | 75.8                        | 79.7                        | 82.9                        | 84.6                        | 87.5                        | 89.4                        |
| 40000.0                                | 74.5                        | 80.2                        | 81.7                        | 83.9                        | 86.6                        | 89.0                        |
| OVERALL<br>SPL                         | 106.8                       | 107.9                       | 107.3                       | 105.3                       | 105.1                       | 103.8                       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 71.3                                  | 70.5                                  | 71.4                                  | 70.7                                   | 70.5                                   | 69.7                                   |
| 250.0                                  | 72.9                                  | 73.4                                  | 72.6                                  | 71.8                                   | 72.2                                   | 70.6                                   |
| 315.2                                  | 75.5                                  | 75.3                                  | 74.9                                  | 74.5                                   | 74.3                                   | 73.5                                   |
| 400.0                                  | 78.1                                  | 77.9                                  | 76.9                                  | 76.0                                   | 76.4                                   | 75.4                                   |
| 500.0                                  | 79.9                                  | 79.2                                  | 79.5                                  | 77.5                                   | 77.6                                   | 76.6                                   |
| 630.0                                  | 82.3                                  | 81.4                                  | 81.0                                  | 80.3                                   | 79.8                                   | 79.5                                   |
| 800.0                                  | 84.3                                  | 83.4                                  | 82.9                                  | 81.0                                   | 81.0                                   | 80.8                                   |
| 1000.0                                 | 86.2                                  | 84.9                                  | 83.8                                  | 82.9                                   | 82.6                                   | 81.7                                   |
| 1250.0                                 | 87.7                                  | 86.6                                  | 85.7                                  | 84.6                                   | 84.4                                   | 83.7                                   |
| 1600.0                                 | 88.8                                  | 87.5                                  | 86.6                                  | 85.6                                   | 85.4                                   | 84.4                                   |
| 2000.0                                 | 90.0                                  | 88.8                                  | 87.7                                  | 86.8                                   | 86.4                                   | 85.6                                   |
| 2500.0                                 | 90.4                                  | 89.0                                  | 88.1                                  | 86.9                                   | 87.0                                   | 86.3                                   |
| 3150.0                                 | 91.0                                  | 89.9                                  | 89.1                                  | 87.9                                   | 87.7                                   | 86.9                                   |
| 4000.0                                 | 91.5                                  | 90.5                                  | 89.7                                  | 88.2                                   | 88.1                                   | 87.5                                   |
| 5000.0                                 | 91.6                                  | 90.6                                  | 89.4                                  | 88.7                                   | 88.5                                   | 88.0                                   |
| 6300.0                                 | 91.9                                  | 90.8                                  | 89.6                                  | 89.0                                   | 88.8                                   | 88.7                                   |
| 8000.0                                 | 91.6                                  | 90.8                                  | 89.5                                  | 88.6                                   | 88.7                                   | 88.7                                   |
| 10000.0                                | 91.7                                  | 90.7                                  | 89.3                                  | 88.7                                   | 88.9                                   | 89.4                                   |
| 12500.0                                | 91.5                                  | 90.5                                  | 89.3                                  | 88.5                                   | 88.4                                   | 89.0                                   |
| 16000.0                                | 90.8                                  | 90.2                                  | 88.9                                  | 87.9                                   | 88.2                                   | 88.5                                   |
| 20000.0                                | 90.3                                  | 89.5                                  | 88.5                                  | 87.3                                   | 87.4                                   | 87.5                                   |
| 25000.0                                | 89.8                                  | 88.9                                  | 88.2                                  | 86.7                                   | 87.0                                   | 86.8                                   |
| 31500.0                                | 89.0                                  | 88.3                                  | 87.8                                  | 85.9                                   | 86.3                                   | 86.0                                   |
| 40000.0                                | 88.5                                  | 88.4                                  | 87.4                                  | 85.2                                   | 86.3                                   | 85.4                                   |
| OVERALL<br>SPL                         | 102.8                                 | 101.9                                 | 100.9                                 | 99.8                                   | 99.8                                   | 99.6                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 11.94 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 58.00 DEG.F, CHAMBER TEMPERATURE = 68.00 DEG.F  
RELATIVE HUMIDITY = 76.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 127

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.853$   
TEMPERATURE RATIO  $TR = 0.981$   
MACH NUMBER  $MJ = 0.982$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 0.823$   
JET DENSITY RATIO  $DJ/D0 = 1.216$   
JET VELOCITY RATIO  $VJ/A0 = 0.890$   
JET VELOCITY  $VJ = 1002.7$  FPS

$TR/TJ = 1.193$   
 $DR/D0 = 1.889$   
 $DR/DJ = 1.554$   
MASS FLOW = 1.981 POUNDS PER SECOND  
THRUST = 62.10 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 66.0                        | 68.3                        | 69.0                        | 68.7                        | 67.8                        | 66.9                        |
| 250.0                                  | 69.3                        | 70.1                        | 69.7                        | 68.5                        | 68.0                        | 66.8                        |
| 315.2                                  | 70.6                        | 71.3                        | 70.6                        | 70.5                        | 69.8                        | 69.3                        |
| 400.0                                  | 73.4                        | 73.6                        | 73.4                        | 72.6                        | 73.0                        | 73.0                        |
| 500.0                                  | 76.0                        | 75.8                        | 76.0                        | 75.8                        | 75.7                        | 74.9                        |
| 630.0                                  | 78.3                        | 78.1                        | 77.9                        | 77.8                        | 77.2                        | 77.0                        |
| 800.0                                  | 80.1                        | 80.2                        | 80.1                        | 79.5                        | 78.6                        | 77.9                        |
| 1000.0                                 | 82.0                        | 82.5                        | 81.2                        | 80.3                        | 80.0                        | 79.3                        |
| 1250.0                                 | 84.4                        | 84.2                        | 82.7                        | 82.4                        | 81.6                        | 81.2                        |
| 1600.0                                 | 85.5                        | 84.5                        | 83.4                        | 83.0                        | 82.6                        | 81.8                        |
| 2000.0                                 | 86.9                        | 85.8                        | 84.7                        | 84.2                        | 83.7                        | 83.2                        |
| 2500.0                                 | 86.8                        | 85.9                        | 84.8                        | 84.4                        | 84.2                        | 83.8                        |
| 3150.0                                 | 87.4                        | 86.6                        | 85.7                        | 85.6                        | 85.3                        | 84.3                        |
| 4000.0                                 | 87.6                        | 87.2                        | 86.2                        | 85.8                        | 85.5                        | 84.6                        |
| 5000.0                                 | 87.4                        | 87.2                        | 86.4                        | 85.8                        | 85.6                        | 85.1                        |
| 6300.0                                 | 87.6                        | 88.0                        | 87.4                        | 86.4                        | 86.5                        | 86.2                        |
| 8000.0                                 | 87.6                        | 88.5                        | 85.9                        | 86.4                        | 86.4                        | 85.9                        |
| 10000.0                                | 88.3                        | 88.4                        | 86.7                        | 86.2                        | 86.7                        | 85.9                        |
| 12500.0                                | 88.1                        | 87.2                        | 86.0                        | 86.2                        | 86.4                        | 86.0                        |
| 16000.0                                | 87.1                        | 86.9                        | 84.6                        | 85.7                        | 86.1                        | 85.6                        |
| 20000.0                                | 85.3                        | 87.0                        | 84.1                        | 84.8                        | 84.9                        | 84.8                        |
| 25000.0                                | 85.0                        | 85.6                        | 83.0                        | 83.9                        | 84.1                        | 84.1                        |
| 31500.0                                | 83.9                        | 85.3                        | 81.8                        | 82.7                        | 83.1                        | 83.2                        |
| 40000.0                                | 82.4                        | 84.6                        | 80.2                        | 82.0                        | 81.5                        | 82.4                        |
| OVERALL<br>SPL                         | 98.9                        | 98.9                        | 97.3                        | 97.3                        | 97.2                        | 96.8                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 75.0                                    | 64.9                                    | 66.5                                    | 66.5                                    |
| 250.0                                  | 67.5                                    | 68.0                                    | 67.6                                    | 67.4                                    |
| 315.2                                  | 69.4                                    | 69.3                                    | 68.1                                    | 68.1                                    |
| 400.0                                  | 72.4                                    | 71.4                                    | 70.7                                    | 69.9                                    |
| 500.0                                  | 74.2                                    | 72.9                                    | 72.4                                    | 70.8                                    |
| 630.0                                  | 76.5                                    | 75.4                                    | 74.1                                    | 72.3                                    |
| 800.0                                  | 77.4                                    | 76.6                                    | 75.6                                    | 73.7                                    |
| 1000.0                                 | 78.6                                    | 77.3                                    | 76.6                                    | 75.0                                    |
| 1250.0                                 | 80.4                                    | 79.5                                    | 78.8                                    | 76.4                                    |
| 1600.0                                 | 81.4                                    | 80.8                                    | 80.2                                    | 78.8                                    |
| 2000.0                                 | 82.7                                    | 82.4                                    | 81.9                                    | 79.9                                    |
| 2500.0                                 | 83.1                                    | 82.8                                    | 82.5                                    | 80.7                                    |
| 3150.0                                 | 84.2                                    | 83.9                                    | 83.6                                    | 82.4                                    |
| 4000.0                                 | 84.6                                    | 84.5                                    | 84.6                                    | 82.7                                    |
| 5000.0                                 | 85.2                                    | 84.8                                    | 85.4                                    | 83.4                                    |
| 6300.0                                 | 86.1                                    | 86.7                                    | 86.7                                    | 84.8                                    |
| 8000.0                                 | 86.4                                    | 86.5                                    | 86.4                                    | 84.9                                    |
| 10000.0                                | 86.6                                    | 87.0                                    | 86.8                                    | 84.6                                    |
| 12500.0                                | 86.2                                    | 86.1                                    | 85.5                                    | 84.0                                    |
| 16000.0                                | 85.7                                    | 85.6                                    | 84.9                                    | 82.7                                    |
| 20000.0                                | 84.7                                    | 84.2                                    | 83.5                                    | 80.9                                    |
| 25000.0                                | 83.6                                    | 82.9                                    | 82.4                                    | 79.2                                    |
| 31500.0                                | 82.1                                    | 81.6                                    | 81.0                                    | 77.1                                    |
| 40000.0                                | 80.7                                    | 80.7                                    | 79.4                                    | 75.0                                    |
| OVERALL<br>SPL                         | 96.7                                    | 96.5                                    | 96.2                                    | 94.2                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.72 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 85.00 DEG.F, CHAMBER TEMPERATURE = 70.00 DEG.F  
RELATIVE HUMIDITY = 66.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 29

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.192  
TEMPERATURE RATIO TR = 1.028  
MACH NUMBER MJ = 0.507  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.978  
JET DENSITY RATIO  $\rho_J/\rho_0$  = 1.022  
JET VELOCITY RATIO  $V_J/A_0$  = 0.501  
JET VELOCITY VJ = 565.5 FPS

TR/TJ = 1.051  
DR/D0 = 1.159  
DR/DJ = 1.133  
MASS FLOW = 0.938 POUNDS PER SECOND  
THRUST = 16.55 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 65.6                                  | 71.7                                  | 59.6                                  | 58.2                                  | 55.7                                  | 56.6                                  |
| 250.0                                  | 66.8                                  | 71.0                                  | 63.4                                  | 60.9                                  | 59.7                                  | 58.5                                  |
| 315.2                                  | 69.2                                  | 70.0                                  | 66.8                                  | 62.7                                  | 62.0                                  | 60.6                                  |
| 400.0                                  | 71.0                                  | 72.3                                  | 67.6                                  | 65.3                                  | 63.4                                  | 62.5                                  |
| 500.0                                  | 73.0                                  | 70.9                                  | 69.9                                  | 66.9                                  | 65.4                                  | 64.0                                  |
| 630.0                                  | 72.3                                  | 72.1                                  | 70.8                                  | 68.4                                  | 67.1                                  | 65.8                                  |
| 800.0                                  | 74.0                                  | 73.2                                  | 72.1                                  | 70.0                                  | 68.2                                  | 67.3                                  |
| 1000.0                                 | 72.9                                  | 72.9                                  | 73.0                                  | 70.7                                  | 69.6                                  | 68.8                                  |
| 1250.0                                 | 73.0                                  | 73.5                                  | 74.0                                  | 71.7                                  | 70.6                                  | 69.5                                  |
| 1600.0                                 | 71.3                                  | 73.2                                  | 73.3                                  | 71.5                                  | 71.0                                  | 70.4                                  |
| 2000.0                                 | 70.2                                  | 72.6                                  | 73.5                                  | 71.9                                  | 71.5                                  | 71.0                                  |
| 2500.0                                 | 68.0                                  | 71.1                                  | 73.0                                  | 71.7                                  | 71.4                                  | 71.1                                  |
| 3150.0                                 | 66.8                                  | 69.9                                  | 72.0                                  | 71.6                                  | 71.6                                  | 71.1                                  |
| 4000.0                                 | 67.7                                  | 69.4                                  | 71.4                                  | 71.2                                  | 72.0                                  | 71.3                                  |
| 5000.0                                 | 66.0                                  | 68.1                                  | 70.0                                  | 69.9                                  | 71.6                                  | 70.9                                  |
| 6300.0                                 | 66.8                                  | 67.0                                  | 69.0                                  | 69.3                                  | 71.2                                  | 71.0                                  |
| 8000.0                                 | 66.2                                  | 65.5                                  | 67.8                                  | 68.3                                  | 70.6                                  | 70.3                                  |
| 10000.0                                | 66.6                                  | 64.3                                  | 66.8                                  | 66.6                                  | 70.0                                  | 70.1                                  |
| 12500.0                                | 64.7                                  | 64.0                                  | 65.7                                  | 66.5                                  | 69.9                                  | 69.8                                  |
| 16000.0                                | 61.5                                  | 62.6                                  | 64.2                                  | 65.1                                  | 69.0                                  | 69.0                                  |
| 20000.0                                | 58.3                                  | 60.8                                  | 62.7                                  | 63.9                                  | 68.0                                  | 68.5                                  |
| 25000.0                                | 57.9                                  | 61.4                                  | 61.9                                  | 62.7                                  | 67.4                                  | 68.3                                  |
| 31500.0                                | 58.4                                  | 62.7                                  | 61.2                                  | 61.7                                  | 67.1                                  | 68.1                                  |
| 40000.0                                | 59.4                                  | 65.4                                  | 60.5                                  | 61.4                                  | 67.5                                  | 68.6                                  |
| OVERALL<br>SPL                         | 82.9                                  | 83.9                                  | 83.6                                  | 82.4                                  | 83.0                                  | 82.7                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 54.9                                  | 56.0                                  | 54.9                                  | 55.4                                   | 55.7                                   | 55.7                                   |
| 250.0                                  | 56.4                                  | 56.8                                  | 57.5                                  | 56.5                                   | 56.6                                   | 55.4                                   |
| 315.2                                  | 58.6                                  | 58.4                                  | 58.8                                  | 58.1                                   | 57.5                                   | 57.5                                   |
| 400.0                                  | 60.8                                  | 60.1                                  | 59.9                                  | 59.6                                   | 59.0                                   | 58.1                                   |
| 500.0                                  | 61.5                                  | 62.0                                  | 61.8                                  | 61.0                                   | 60.8                                   | 60.1                                   |
| 630.0                                  | 64.4                                  | 63.2                                  | 63.4                                  | 62.6                                   | 62.4                                   | 61.5                                   |
| 800.0                                  | 64.7                                  | 64.7                                  | 64.6                                  | 63.8                                   | 63.4                                   | 62.9                                   |
| 1000.0                                 | 66.6                                  | 66.1                                  | 65.4                                  | 64.6                                   | 64.4                                   | 63.7                                   |
| 1250.0                                 | 68.4                                  | 67.7                                  | 67.0                                  | 66.6                                   | 66.1                                   | 65.5                                   |
| 1600.0                                 | 68.8                                  | 68.2                                  | 67.6                                  | 66.9                                   | 66.6                                   | 65.8                                   |
| 2000.0                                 | 69.3                                  | 68.8                                  | 68.4                                  | 67.5                                   | 67.4                                   | 66.6                                   |
| 2500.0                                 | 69.6                                  | 69.1                                  | 68.6                                  | 68.1                                   | 68.0                                   | 67.2                                   |
| 3150.0                                 | 69.6                                  | 69.6                                  | 69.3                                  | 68.7                                   | 68.4                                   | 67.9                                   |
| 4000.0                                 | 70.1                                  | 70.0                                  | 69.5                                  | 68.9                                   | 68.8                                   | 68.4                                   |
| 5000.0                                 | 70.0                                  | 70.0                                  | 69.4                                  | 69.1                                   | 68.9                                   | 68.7                                   |
| 6300.0                                 | 70.2                                  | 70.0                                  | 69.3                                  | 69.3                                   | 69.3                                   | 69.0                                   |
| 8000.0                                 | 69.5                                  | 69.7                                  | 69.0                                  | 68.8                                   | 68.8                                   | 68.7                                   |
| 10000.0                                | 69.5                                  | 69.5                                  | 68.6                                  | 68.5                                   | 68.4                                   | 68.7                                   |
| 12500.0                                | 69.1                                  | 69.1                                  | 68.4                                  | 68.1                                   | 67.8                                   | 68.2                                   |
| 16000.0                                | 68.6                                  | 68.5                                  | 68.0                                  | 67.1                                   | 67.3                                   | 67.4                                   |
| 20000.0                                | 68.2                                  | 67.6                                  | 67.2                                  | 66.1                                   | 66.3                                   | 66.1                                   |
| 25000.0                                | 68.0                                  | 67.0                                  | 66.9                                  | 65.2                                   | 65.7                                   | 65.1                                   |
| 31500.0                                | 68.1                                  | 66.2                                  | 66.4                                  | 64.2                                   | 65.1                                   | 64.1                                   |
| 40000.0                                | 69.4                                  | 66.0                                  | 65.9                                  | 63.6                                   | 65.2                                   | 63.4                                   |
| OVERALL<br>SPL                         | 81.7                                  | 81.2                                  | 80.8                                  | 80.1                                   | 80.1                                   | 79.7                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.71 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 71.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 56.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 207

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.191$   
TEMPERATURE RATIO  $TR = 1.027$   
MACH NUMBER  $MJ = 0.506$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.977$   
JET DENSITY RATIO  $DJ/D_0 = 1.024$   
JET VELOCITY RATIO  $VJ/A_0 = 0.500$   
JET VELOCITY  $VJ = 557.6$  FPS

$TR/TJ = 1.051$   
 $DR/D_0 = 1.160$   
 $DR/DJ = 1.133$   
MASS FLOW = 0.938 POUNDS PER SECOND  
THRUST = 16.51 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 52.6                                   | 55.2                                   | 55.6                                   | 54.3                                    | 53.4                                    | 54.8                                    |
| 250.0                                  | 55.0                                   | 56.2                                   | 55.4                                   | 54.8                                    | 54.1                                    | 54.0                                    |
| 315.2                                  | 56.0                                   | 57.5                                   | 56.6                                   | 57.3                                    | 56.0                                    | 56.2                                    |
| 400.0                                  | 58.8                                   | 59.4                                   | 58.3                                   | 58.3                                    | 58.4                                    | 58.4                                    |
| 500.0                                  | 60.6                                   | 60.8                                   | 60.3                                   | 60.7                                    | 59.9                                    | 59.2                                    |
| 630.0                                  | 63.0                                   | 62.6                                   | 61.9                                   | 61.8                                    | 60.8                                    | 60.4                                    |
| 800.0                                  | 64.4                                   | 64.4                                   | 63.6                                   | 62.5                                    | 61.6                                    | 61.5                                    |
| 1000.0                                 | 65.6                                   | 65.3                                   | 63.9                                   | 63.9                                    | 62.7                                    | 62.2                                    |
| 1250.0                                 | 66.6                                   | 66.5                                   | 65.0                                   | 65.4                                    | 64.2                                    | 63.6                                    |
| 1600.0                                 | 67.4                                   | 66.6                                   | 65.5                                   | 65.5                                    | 64.6                                    | 63.8                                    |
| 2000.0                                 | 68.0                                   | 67.3                                   | 66.2                                   | 66.4                                    | 65.4                                    | 65.0                                    |
| 2500.0                                 | 68.2                                   | 67.6                                   | 66.5                                   | 66.7                                    | 66.1                                    | 65.6                                    |
| 3150.0                                 | 68.5                                   | 68.0                                   | 67.1                                   | 67.7                                    | 66.7                                    | 66.4                                    |
| 4000.0                                 | 68.8                                   | 68.6                                   | 67.6                                   | 68.0                                    | 67.1                                    | 66.6                                    |
| 5000.0                                 | 68.7                                   | 68.9                                   | 67.9                                   | 67.9                                    | 67.4                                    | 66.6                                    |
| 6300.0                                 | 68.6                                   | 69.0                                   | 67.9                                   | 68.0                                    | 68.0                                    | 67.1                                    |
| 8000.0                                 | 68.7                                   | 69.7                                   | 66.7                                   | 67.7                                    | 67.0                                    | 66.4                                    |
| 10000.0                                | 69.0                                   | 68.9                                   | 66.7                                   | 67.4                                    | 67.0                                    | 65.9                                    |
| 12500.0                                | 69.0                                   | 67.5                                   | 66.5                                   | 66.9                                    | 66.3                                    | 65.6                                    |
| 16000.0                                | 67.5                                   | 67.8                                   | 65.0                                   | 66.4                                    | 65.7                                    | 65.0                                    |
| 20000.0                                | 66.2                                   | 67.7                                   | 64.6                                   | 65.7                                    | 64.9                                    | 64.6                                    |
| 25000.0                                | 67.3                                   | 66.4                                   | 63.9                                   | 65.3                                    | 64.5                                    | 64.5                                    |
| 31500.0                                | 66.8                                   | 66.7                                   | 63.1                                   | 65.4                                    | 64.4                                    | 64.7                                    |
| 40000.0                                | 66.3                                   | 67.0                                   | 62.7                                   | 66.0                                    | 64.1                                    | 65.4                                    |
| OVERALL<br>SPL                         | 80.5                                   | 80.4                                   | 78.7                                   | 79.3                                    | 78.5                                    | 78.1                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 54.9  |       | 56.7  |       | 53.8  |       | 55.4  |  |
| 250.0   |       | 54.4  |       | 54.7  |       | 54.5  |       | 55.2  |  |
| 315.2   |       | 55.8  |       | 56.0  |       | 54.6  |       | 55.2  |  |
| 400.0   |       | 57.9  |       | 56.4  |       | 56.1  |       | 56.2  |  |
| 500.0   |       | 58.3  |       | 57.7  |       | 56.7  |       | 56.4  |  |
| 630.0   |       | 59.6  |       | 58.7  |       | 58.0  |       | 57.1  |  |
| 800.0   |       | 60.4  |       | 59.8  |       | 58.6  |       | 57.8  |  |
| 1000.0  |       | 61.3  |       | 60.1  |       | 59.2  |       | 58.3  |  |
| 1250.0  |       | 62.9  |       | 61.5  |       | 60.2  |       | 58.3  |  |
| 1600.0  |       | 63.2  |       | 61.9  |       | 60.4  |       | 59.2  |  |
| 2000.0  |       | 64.0  |       | 63.0  |       | 61.8  |       | 59.9  |  |
| 2500.0  |       | 64.7  |       | 63.9  |       | 61.9  |       | 60.4  |  |
| 3150.0  |       | 65.6  |       | 64.7  |       | 63.0  |       | 61.2  |  |
| 4000.0  |       | 66.2  |       | 65.1  |       | 63.3  |       | 61.1  |  |
| 5000.0  |       | 66.3  |       | 64.6  |       | 62.8  |       | 60.6  |  |
| 6300.0  |       | 66.8  |       | 64.9  |       | 62.8  |       | 60.5  |  |
| 8000.0  |       | 66.1  |       | 64.7  |       | 62.0  |       | 60.1  |  |
| 10000.0 |       | 66.1  |       | 64.3  |       | 61.7  |       | 59.5  |  |
| 12500.0 |       | 65.3  |       | 63.8  |       | 60.8  |       | 58.6  |  |
| 16000.0 |       | 64.9  |       | 63.4  |       | 60.5  |       | 57.9  |  |
| 20000.0 |       | 64.3  |       | 62.6  |       | 59.7  |       | 56.9  |  |
| 25000.0 |       | 64.0  |       | 62.1  |       | 59.4  |       | 56.1  |  |
| 31500.0 |       | 63.9  |       | 62.2  |       | 59.3  |       | 55.6  |  |
| 40000.0 |       | 64.2  |       | 62.6  |       | 59.1  |       | 55.2  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 77.5  |       | 76.2  |       | 74.1  |       | 72.3  |  |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.02 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 97.00 DEG.F, CHAMBER TEMPERATURE = 70.50 DEG.F  
RELATIVE HUMIDITY = 63.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 30

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.283$   
TEMPERATURE RATIO  $TR = 1.050$   
MACH NUMBER  $MJ = 0.608$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.978$   
JET DENSITY RATIO  $DJ/D_0 = 1.023$   
JET VELOCITY RATIO  $VJ/A_0 = 0.601$   
JET VELOCITY  $VJ = 678.3$  FPS

$TR/TJ = 1.074$   
 $DR/D_0 = 1.222$   
 $DR/DJ = 1.195$   
MASS FLOW = 1.125 POUNDS PER SECOND  
THRUST = 23.79 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 73.0                                  | 74.1                                  | 66.0                                  | 62.8                                  | 61.4                                  | 59.2                                  |
| 250.0                                  | 73.6                                  | 74.5                                  | 69.5                                  | 66.5                                  | 64.4                                  | 62.2                                  |
| 315.2                                  | 76.6                                  | 75.4                                  | 73.0                                  | 68.4                                  | 66.6                                  | 63.4                                  |
| 400.0                                  | 78.3                                  | 78.7                                  | 73.6                                  | 71.0                                  | 68.4                                  | 66.5                                  |
| 500.0                                  | 80.3                                  | 78.7                                  | 76.7                                  | 72.7                                  | 70.7                                  | 68.1                                  |
| 630.0                                  | 80.3                                  | 80.0                                  | 78.6                                  | 75.0                                  | 72.8                                  | 69.9                                  |
| 800.0                                  | 82.2                                  | 81.9                                  | 79.3                                  | 76.1                                  | 74.0                                  | 71.9                                  |
| 1000.0                                 | 80.7                                  | 80.9                                  | 79.8                                  | 77.2                                  | 75.6                                  | 73.2                                  |
| 1250.0                                 | 80.1                                  | 81.4                                  | 81.0                                  | 78.6                                  | 77.0                                  | 74.5                                  |
| 1600.0                                 | 78.5                                  | 80.6                                  | 80.9                                  | 78.6                                  | 77.5                                  | 75.4                                  |
| 2000.0                                 | 76.8                                  | 79.8                                  | 80.8                                  | 79.1                                  | 78.2                                  | 75.9                                  |
| 2500.0                                 | 75.0                                  | 78.2                                  | 80.1                                  | 78.6                                  | 78.1                                  | 76.1                                  |
| 3150.0                                 | 73.4                                  | 76.9                                  | 79.1                                  | 78.8                                  | 78.5                                  | 76.4                                  |
| 4000.0                                 | 73.8                                  | 76.2                                  | 78.6                                  | 78.2                                  | 78.7                                  | 76.6                                  |
| 5000.0                                 | 72.3                                  | 74.8                                  | 77.2                                  | 77.2                                  | 78.1                                  | 76.5                                  |
| 6300.0                                 | 72.7                                  | 74.0                                  | 76.3                                  | 76.6                                  | 78.0                                  | 76.5                                  |
| 8000.0                                 | 72.3                                  | 72.7                                  | 75.0                                  | 75.6                                  | 77.5                                  | 75.9                                  |
| 10000.0                                | 72.0                                  | 71.4                                  | 73.9                                  | 74.8                                  | 77.0                                  | 75.9                                  |
| 12500.0                                | 70.8                                  | 70.7                                  | 72.9                                  | 74.0                                  | 76.5                                  | 75.8                                  |
| 16000.0                                | 67.7                                  | 69.1                                  | 71.6                                  | 72.8                                  | 75.4                                  | 75.1                                  |
| 20000.0                                | 64.3                                  | 67.0                                  | 70.3                                  | 71.5                                  | 74.3                                  | 74.7                                  |
| 25000.0                                | 63.4                                  | 66.6                                  | 69.5                                  | 70.5                                  | 73.4                                  | 74.4                                  |
| 31500.0                                | 62.7                                  | 66.5                                  | 68.7                                  | 69.3                                  | 72.6                                  | 74.1                                  |
| 40000.0                                | 62.2                                  | 67.8                                  | 67.9                                  | 68.8                                  | 72.2                                  | 74.6                                  |
| OVERALL<br>SPL                         | 90.2                                  | 91.0                                  | 90.8                                  | 89.3                                  | 89.5                                  | 88.1                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 58.7                                  | 59.0                                  | 59.3                                  | 59.4                                   | 58.5                                   | 58.9                                   |
| 250.0                                  | 60.8                                  | 61.0                                  | 61.2                                  | 60.5                                   | 60.4                                   | 59.3                                   |
| 315.2                                  | 62.8                                  | 63.0                                  | 62.6                                  | 61.8                                   | 61.7                                   | 60.9                                   |
| 400.0                                  | 65.0                                  | 65.5                                  | 64.2                                  | 63.8                                   | 63.4                                   | 62.4                                   |
| 500.0                                  | 66.0                                  | 66.4                                  | 66.3                                  | 65.0                                   | 65.0                                   | 64.1                                   |
| 630.0                                  | 68.6                                  | 68.4                                  | 68.1                                  | 66.9                                   | 66.9                                   | 66.2                                   |
| 800.0                                  | 70.1                                  | 70.0                                  | 69.6                                  | 68.8                                   | 68.4                                   | 67.6                                   |
| 1000.0                                 | 71.4                                  | 71.2                                  | 70.8                                  | 69.9                                   | 69.4                                   | 68.8                                   |
| 1250.0                                 | 72.8                                  | 72.8                                  | 72.3                                  | 71.4                                   | 70.8                                   | 70.1                                   |
| 1600.0                                 | 73.6                                  | 73.4                                  | 72.9                                  | 71.8                                   | 71.6                                   | 71.0                                   |
| 2000.0                                 | 74.7                                  | 74.4                                  | 73.6                                  | 72.8                                   | 72.3                                   | 71.9                                   |
| 2500.0                                 | 75.0                                  | 74.7                                  | 74.2                                  | 73.3                                   | 73.1                                   | 72.5                                   |
| 3150.0                                 | 75.3                                  | 75.0                                  | 74.7                                  | 73.9                                   | 73.7                                   | 73.4                                   |
| 4000.0                                 | 76.0                                  | 75.6                                  | 75.2                                  | 74.3                                   | 74.1                                   | 73.7                                   |
| 5000.0                                 | 75.9                                  | 75.6                                  | 75.1                                  | 74.5                                   | 74.4                                   | 74.1                                   |
| 6300.0                                 | 76.0                                  | 75.7                                  | 75.0                                  | 74.7                                   | 74.6                                   | 74.6                                   |
| 8000.0                                 | 75.7                                  | 75.5                                  | 74.9                                  | 74.2                                   | 74.3                                   | 74.4                                   |
| 10000.0                                | 75.6                                  | 75.4                                  | 74.6                                  | 74.2                                   | 74.5                                   | 74.7                                   |
| 12500.0                                | 75.5                                  | 75.1                                  | 74.5                                  | 73.8                                   | 73.7                                   | 74.0                                   |
| 16000.0                                | 74.9                                  | 74.5                                  | 74.1                                  | 72.9                                   | 73.2                                   | 73.4                                   |
| 20000.0                                | 74.6                                  | 73.8                                  | 73.4                                  | 72.1                                   | 72.4                                   | 72.1                                   |
| 25000.0                                | 74.3                                  | 73.1                                  | 73.1                                  | 71.4                                   | 71.9                                   | 71.2                                   |
| 31500.0                                | 74.1                                  | 72.3                                  | 72.4                                  | 70.4                                   | 71.4                                   | 70.1                                   |
| 40000.0                                | 74.6                                  | 72.1                                  | 71.9                                  | 69.8                                   | 71.7                                   | 69.2                                   |
| OVERALL<br>SPL                         | 87.4                                  | 86.9                                  | 86.4                                  | 85.5                                   | 85.6                                   | 85.2                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.01 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 82.00 DEG.F, CHAMBER TEMPERATURE = 56.00 DEG.F  
RELATIVE HUMIDITY = 66.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 208

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.283  
TEMPERATURE RATIO TR = 1.050  
MACH NUMBER MJ = 0.607  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.978  
JET DENSITY RATIO DJ/D0 = 1.022  
JET VELOCITY RATIO VJ/A0 = 0.601  
JET VELOCITY VJ = 668.8 FPS

TR/TJ = 1.074  
DR/D0 = 1.221  
DR/DJ = 1.195  
MASS FLOW = 1.124 POUNDS PER SECOND  
THRUST = 23.77 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 57.2                                   | 58.7                                   | 59.0                                   | 58.7                                    | 57.4                                    | 57.6                                    |
| 250.0                                  | 59.8                                   | 59.8                                   | 59.0                                   | 58.4                                    | 58.4                                    | 57.5                                    |
| 315.2                                  | 61.2                                   | 61.6                                   | 61.2                                   | 60.8                                    | 60.4                                    | 59.9                                    |
| 400.0                                  | 62.9                                   | 63.7                                   | 63.0                                   | 62.8                                    | 62.4                                    | 62.8                                    |
| 500.0                                  | 65.6                                   | 65.1                                   | 65.7                                   | 64.9                                    | 64.8                                    | 63.8                                    |
| 630.0                                  | 67.3                                   | 67.1                                   | 67.0                                   | 66.7                                    | 65.9                                    | 65.3                                    |
| 800.0                                  | 69.0                                   | 69.4                                   | 68.4                                   | 67.7                                    | 67.0                                    | 66.4                                    |
| 1000.0                                 | 70.6                                   | 70.1                                   | 69.0                                   | 68.7                                    | 67.8                                    | 67.2                                    |
| 1250.0                                 | 72.0                                   | 71.3                                   | 70.7                                   | 70.1                                    | 69.4                                    | 68.9                                    |
| 1600.0                                 | 72.6                                   | 72.0                                   | 71.0                                   | 70.3                                    | 70.2                                    | 69.0                                    |
| 2000.0                                 | 73.2                                   | 72.8                                   | 72.0                                   | 71.4                                    | 70.8                                    | 70.3                                    |
| 2500.0                                 | 73.6                                   | 73.2                                   | 72.4                                   | 71.9                                    | 71.9                                    | 71.0                                    |
| 3150.0                                 | 74.1                                   | 73.8                                   | 73.2                                   | 72.8                                    | 72.6                                    | 71.9                                    |
| 4000.0                                 | 74.3                                   | 74.1                                   | 73.7                                   | 73.0                                    | 72.9                                    | 72.1                                    |
| 5000.0                                 | 74.1                                   | 74.4                                   | 74.0                                   | 73.1                                    | 72.9                                    | 72.0                                    |
| 6300.0                                 | 74.5                                   | 75.3                                   | 74.3                                   | 73.7                                    | 73.4                                    | 72.8                                    |
| 8000.0                                 | 74.6                                   | 75.4                                   | 73.2                                   | 73.3                                    | 72.9                                    | 72.2                                    |
| 10000.0                                | 75.0                                   | 75.0                                   | 73.8                                   | 73.4                                    | 73.2                                    | 72.1                                    |
| 12500.0                                | 75.4                                   | 73.6                                   | 73.3                                   | 72.7                                    | 72.5                                    | 71.6                                    |
| 16000.0                                | 73.7                                   | 73.6                                   | 71.8                                   | 72.0                                    | 71.8                                    | 70.9                                    |
| 20000.0                                | 72.4                                   | 73.4                                   | 71.7                                   | 71.4                                    | 70.9                                    | 70.5                                    |
| 25000.0                                | 73.4                                   | 72.0                                   | 71.2                                   | 71.0                                    | 70.6                                    | 70.4                                    |
| 31500.0                                | 73.1                                   | 72.4                                   | 71.1                                   | 70.9                                    | 70.4                                    | 70.6                                    |
| 40000.0                                | 72.8                                   | 72.6                                   | 70.9                                   | 71.4                                    | 70.1                                    | 71.1                                    |
| OVERALL<br>SPL                         | 86.2                                   | 86.0                                   | 85.0                                   | 84.6                                    | 84.3                                    | 83.6                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 57.3  |       | 57.9  |       | 57.3  |       | 58.0  |  |
| 250.0   |       | 58.6  |       | 58.3  |       | 58.9  |       | 58.9  |  |
| 315.2   |       | 60.1  |       | 58.8  |       | 59.0  |       | 58.3  |  |
| 400.0   |       | 62.2  |       | 60.6  |       | 60.4  |       | 60.3  |  |
| 500.0   |       | 63.3  |       | 61.8  |       | 61.4  |       | 60.6  |  |
| 630.0   |       | 64.7  |       | 63.6  |       | 62.7  |       | 61.3  |  |
| 800.0   |       | 66.0  |       | 64.3  |       | 63.6  |       | 62.3  |  |
| 1000.0  |       | 66.6  |       | 65.0  |       | 64.1  |       | 62.8  |  |
| 1250.0  |       | 67.9  |       | 66.4  |       | 65.6  |       | 63.6  |  |
| 1600.0  |       | 68.6  |       | 66.9  |       | 65.9  |       | 64.8  |  |
| 2000.0  |       | 69.8  |       | 68.5  |       | 67.5  |       | 65.6  |  |
| 2500.0  |       | 70.8  |       | 69.2  |       | 68.1  |       | 66.4  |  |
| 3150.0  |       | 71.9  |       | 70.1  |       | 68.8  |       | 67.3  |  |
| 4000.0  |       | 72.1  |       | 70.4  |       | 69.3  |       | 67.2  |  |
| 5000.0  |       | 72.1  |       | 70.0  |       | 68.9  |       | 66.9  |  |
| 6300.0  |       | 72.7  |       | 70.6  |       | 69.0  |       | 67.2  |  |
| 8000.0  |       | 72.6  |       | 70.4  |       | 68.4  |       | 66.6  |  |
| 10000.0 |       | 72.3  |       | 69.9  |       | 68.2  |       | 65.5  |  |
| 12500.0 |       | 71.9  |       | 69.6  |       | 67.1  |       | 65.1  |  |
| 16000.0 |       | 71.4  |       | 69.0  |       | 66.6  |       | 64.1  |  |
| 20000.0 |       | 70.8  |       | 68.2  |       | 65.9  |       | 63.0  |  |
| 25000.0 |       | 70.4  |       | 67.7  |       | 65.5  |       | 62.3  |  |
| 31500.0 |       | 70.3  |       | 67.6  |       | 65.4  |       | 61.8  |  |
| 40000.0 |       | 70.6  |       | 68.1  |       | 65.1  |       | 61.4  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 83.6  |       | 81.5  |       | 80.0  |       | 78.1  |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 5.65 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 112.00 DEG.F, CHAMBER TEMPERATURE = 70.50 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 31

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.398  
TEMPERATURE RATIO TR = 1.078  
MACH NUMBER MJ = 0.709  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.980  
JET DENSITY RATIO DJ/D0 = 1.021  
JET VELOCITY RATIO VJ/A0 = 0.701  
JET VELOCITY VJ = 792.0 FPS

TR/TJ = 1.100  
DR/D0 = 1.296  
DR/DJ = 1.270  
MASS FLOW = 1.311 POUNDS PER SECOND  
THRUST = 32.37 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 76.0                                  | 77.8                                  | 70.6                                  | 67.7                                  | 65.7                                  | 63.8                                  |
| 250.0                                  | 78.1                                  | 79.3                                  | 73.9                                  | 70.9                                  | 68.8                                  | 66.3                                  |
| 315.2                                  | 81.5                                  | 81.0                                  | 77.9                                  | 73.6                                  | 71.3                                  | 69.6                                  |
| 400.0                                  | 83.8                                  | 84.3                                  | 79.7                                  | 76.2                                  | 74.3                                  | 71.7                                  |
| 500.0                                  | 86.2                                  | 84.4                                  | 82.7                                  | 78.1                                  | 76.2                                  | 73.8                                  |
| 630.0                                  | 85.8                                  | 86.5                                  | 84.4                                  | 80.7                                  | 78.5                                  | 75.7                                  |
| 800.0                                  | 88.7                                  | 88.0                                  | 86.2                                  | 82.5                                  | 80.5                                  | 77.7                                  |
| 1000.0                                 | 87.9                                  | 87.8                                  | 86.6                                  | 83.1                                  | 81.7                                  | 79.5                                  |
| 1250.0                                 | 86.9                                  | 88.2                                  | 87.7                                  | 84.4                                  | 83.2                                  | 80.8                                  |
| 1600.0                                 | 84.6                                  | 86.6                                  | 87.1                                  | 84.4                                  | 83.5                                  | 81.9                                  |
| 2000.0                                 | 82.5                                  | 85.7                                  | 86.8                                  | 84.8                                  | 84.3                                  | 83.0                                  |
| 2500.0                                 | 80.7                                  | 83.9                                  | 85.9                                  | 84.2                                  | 84.5                                  | 83.1                                  |
| 3150.0                                 | 79.3                                  | 82.8                                  | 84.8                                  | 84.2                                  | 84.5                                  | 83.4                                  |
| 4000.0                                 | 79.3                                  | 81.9                                  | 84.0                                  | 83.6                                  | 84.8                                  | 83.4                                  |
| 5000.0                                 | 78.2                                  | 80.9                                  | 82.5                                  | 82.5                                  | 84.3                                  | 83.5                                  |
| 6300.0                                 | 78.3                                  | 80.1                                  | 81.6                                  | 82.1                                  | 84.0                                  | 83.6                                  |
| 8000.0                                 | 77.9                                  | 78.7                                  | 80.2                                  | 81.0                                  | 83.3                                  | 82.9                                  |
| 10000.0                                | 78.0                                  | 77.8                                  | 79.0                                  | 80.1                                  | 82.7                                  | 82.8                                  |
| 12500.0                                | 76.4                                  | 77.0                                  | 78.7                                  | 79.5                                  | 82.2                                  | 82.6                                  |
| 16000.0                                | 73.3                                  | 75.5                                  | 77.4                                  | 78.3                                  | 81.3                                  | 82.0                                  |
| 20000.0                                | 70.2                                  | 73.4                                  | 76.2                                  | 77.0                                  | 80.3                                  | 81.3                                  |
| 25000.0                                | 68.8                                  | 72.8                                  | 75.2                                  | 75.8                                  | 79.3                                  | 81.1                                  |
| 31500.0                                | 67.8                                  | 71.8                                  | 74.2                                  | 74.3                                  | 78.3                                  | 80.6                                  |
| 40000.0                                | 66.6                                  | 71.7                                  | 73.3                                  | 73.7                                  | 77.3                                  | 80.2                                  |
| OVERALL<br>SPL                         | 96.3                                  | 97.1                                  | 96.8                                  | 94.9                                  | 95.5                                  | 94.8                                  |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 63.0                                  | 63.8                                  | 63.4                                  | 63.0                                   | 62.1                                   | 62.5                                   |
| 250.0                                  | 66.1                                  | 65.0                                  | 65.5                                  | 63.9                                   | 63.8                                   | 62.8                                   |
| 315.2                                  | 68.1                                  | 67.5                                  | 67.2                                  | 66.2                                   | 65.3                                   | 65.3                                   |
| 400.0                                  | 70.8                                  | 69.9                                  | 68.7                                  | 67.8                                   | 67.4                                   | 66.9                                   |
| 500.0                                  | 72.0                                  | 71.0                                  | 71.0                                  | 69.6                                   | 68.7                                   | 68.5                                   |
| 630.0                                  | 74.6                                  | 73.3                                  | 72.7                                  | 71.2                                   | 70.4                                   | 70.2                                   |
| 800.0                                  | 76.5                                  | 75.3                                  | 74.2                                  | 72.6                                   | 72.1                                   | 71.8                                   |
| 1000.0                                 | 77.8                                  | 76.7                                  | 75.5                                  | 74.1                                   | 73.2                                   | 73.1                                   |
| 1250.0                                 | 79.3                                  | 78.1                                  | 77.1                                  | 75.6                                   | 74.9                                   | 74.5                                   |
| 1600.0                                 | 80.2                                  | 79.3                                  | 77.7                                  | 76.3                                   | 75.5                                   | 75.5                                   |
| 2000.0                                 | 81.1                                  | 80.1                                  | 78.8                                  | 77.2                                   | 76.4                                   | 76.4                                   |
| 2500.0                                 | 81.8                                  | 80.2                                  | 79.2                                  | 77.9                                   | 77.1                                   | 77.1                                   |
| 3150.0                                 | 82.0                                  | 80.8                                  | 79.9                                  | 78.8                                   | 78.0                                   | 78.2                                   |
| 4000.0                                 | 82.4                                  | 81.6                                  | 80.3                                  | 79.2                                   | 78.4                                   | 78.4                                   |
| 5000.0                                 | 82.6                                  | 81.7                                  | 80.3                                  | 79.5                                   | 78.7                                   | 79.1                                   |
| 6300.0                                 | 82.8                                  | 81.9                                  | 80.3                                  | 79.8                                   | 79.0                                   | 79.5                                   |
| 8000.0                                 | 82.6                                  | 81.7                                  | 80.4                                  | 79.5                                   | 78.9                                   | 79.4                                   |
| 10000.0                                | 82.5                                  | 82.0                                  | 80.5                                  | 79.3                                   | 78.8                                   | 79.5                                   |
| 12500.0                                | 82.3                                  | 81.6                                  | 80.1                                  | 78.9                                   | 78.6                                   | 79.3                                   |
| 16000.0                                | 81.6                                  | 81.1                                  | 79.8                                  | 78.0                                   | 78.2                                   | 78.7                                   |
| 20000.0                                | 81.0                                  | 80.4                                  | 79.4                                  | 77.3                                   | 77.5                                   | 77.5                                   |
| 25000.0                                | 80.5                                  | 79.9                                  | 79.2                                  | 76.6                                   | 77.2                                   | 76.6                                   |
| 31500.0                                | 79.7                                  | 79.1                                  | 78.8                                  | 75.7                                   | 76.8                                   | 75.6                                   |
| 40000.0                                | 79.1                                  | 79.0                                  | 78.3                                  | 75.1                                   | 77.2                                   | 75.0                                   |
| OVERALL<br>SPL                         | 93.9                                  | 93.0                                  | 91.9                                  | 90.4                                   | 90.1                                   | 90.1                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 5.57 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 107.00 DEG.F, CHAMBER TEMPERATURE = 68.00 DEG.F  
RELATIVE HUMIDITY = 76.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 130

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.398$   
TEMPERATURE RATIO  $T_R = 1.074$   
MACH NUMBER  $M_J = 0.709$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 0.976$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 1.025$   
JET VELOCITY RATIO  $V_J/A_0 = 0.700$   
JET VELOCITY  $V_J = 788.5$  FPS

$T_R/T_J = 1.100$   
 $D_R/D_0 = 1.302$   
 $D_R/D_J = 1.270$   
MASS FLOW = 1.313 POUNDS PER SECOND  
THRUST = 32.37 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>120.0 |
|--|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 61.0                        |               | 62.3                        |               | 63.0                        |               | 61.5                        |                | 61.6                        |                | 60.0                        |                |
| 250.0                                  | 63.3                        |               | 63.4                        |               | 62.8                        |               | 61.8                        |                | 61.6                        |                | 61.0                        |                |
| 315.2                                  | 64.6                        |               | 64.8                        |               | 64.3                        |               | 64.0                        |                | 63.2                        |                | 62.7                        |                |
| 400.0                                  | 67.4                        |               | 67.6                        |               | 66.8                        |               | 66.1                        |                | 65.9                        |                | 66.3                        |                |
| 500.0                                  | 69.2                        |               | 69.0                        |               | 68.8                        |               | 69.0                        |                | 68.1                        |                | 67.7                        |                |
| 630.0                                  | 71.3                        |               | 70.8                        |               | 70.7                        |               | 70.5                        |                | 69.4                        |                | 69.5                        |                |
| 800.0                                  | 73.5                        |               | 73.1                        |               | 72.6                        |               | 71.6                        |                | 70.7                        |                | 70.1                        |                |
| 1000.0                                 | 75.0                        |               | 74.5                        |               | 73.5                        |               | 72.5                        |                | 71.8                        |                | 71.0                        |                |
| 1250.0                                 | 76.9                        |               | 75.8                        |               | 75.1                        |               | 74.1                        |                | 73.7                        |                | 72.9                        |                |
| 1600.0                                 | 77.9                        |               | 76.4                        |               | 75.7                        |               | 74.7                        |                | 74.3                        |                | 73.6                        |                |
| 2000.0                                 | 78.6                        |               | 77.3                        |               | 76.6                        |               | 75.9                        |                | 75.2                        |                | 74.8                        |                |
| 2500.0                                 | 78.8                        |               | 77.9                        |               | 77.0                        |               | 76.4                        |                | 76.0                        |                | 75.5                        |                |
| 3150.0                                 | 79.4                        |               | 78.4                        |               | 77.9                        |               | 77.7                        |                | 77.1                        |                | 76.6                        |                |
| 4000.0                                 | 79.7                        |               | 78.9                        |               | 78.5                        |               | 77.8                        |                | 77.1                        |                | 76.6                        |                |
| 5000.0                                 | 79.2                        |               | 79.2                        |               | 78.9                        |               | 77.9                        |                | 77.4                        |                | 76.9                        |                |
| 6300.0                                 | 79.4                        |               | 79.8                        |               | 79.3                        |               | 78.1                        |                | 78.3                        |                | 78.0                        |                |
| 8000.0                                 | 79.5                        |               | 80.5                        |               | 78.3                        |               | 78.1                        |                | 77.6                        |                | 77.3                        |                |
| 10000.0                                | 80.0                        |               | 80.1                        |               | 78.6                        |               | 77.8                        |                | 77.8                        |                | 76.7                        |                |
| 12500.0                                | 80.0                        |               | 78.9                        |               | 78.5                        |               | 77.5                        |                | 77.1                        |                | 76.8                        |                |
| 16000.0                                | 78.5                        |               | 79.0                        |               | 77.4                        |               | 77.1                        |                | 76.6                        |                | 76.5                        |                |
| 20000.0                                | 76.8                        |               | 78.9                        |               | 77.1                        |               | 76.2                        |                | 75.5                        |                | 75.7                        |                |
| 25000.0                                | 77.3                        |               | 77.5                        |               | 76.5                        |               | 75.5                        |                | 75.1                        |                | 75.4                        |                |
| 31500.0                                | 76.2                        |               | 77.2                        |               | 75.8                        |               | 74.4                        |                | 74.3                        |                | 74.7                        |                |
| 40000.0                                | 74.4                        |               | 76.6                        |               | 74.9                        |               | 73.9                        |                | 73.2                        |                | 74.4                        |                |
| OVERALL<br>SPL                         | 90.9                        |               | 90.8                        |               | 89.8                        |               | 89.1                        |                | 88.6                        |                | 88.3                        |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|-------------------------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
| FREQ.<br>HZ             | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|                         | 16             | 127.5 | 17             | 135.0 | 18             | 142.5 | 19             | 150.0 |
| 200.0                   | 59.4           |       | 61.3           |       | 61.0           |       | 60.7           |       |
| 250.0                   | 61.5           |       | 61.3           |       | 61.7           |       | 61.4           |       |
| 315.2                   | 62.9           |       | 62.6           |       | 62.1           |       | 62.3           |       |
| 400.0                   | 65.5           |       | 64.1           |       | 63.8           |       | 63.4           |       |
| 500.0                   | 67.2           |       | 66.1           |       | 65.4           |       | 64.2           |       |
| 630.0                   | 68.9           |       | 68.0           |       | 67.0           |       | 64.9           |       |
| 800.0                   | 69.4           |       | 68.9           |       | 68.0           |       | 66.0           |       |
| 1000.0                  | 70.6           |       | 69.6           |       | 68.4           |       | 66.9           |       |
| 1250.0                  | 72.4           |       | 71.2           |       | 69.9           |       | 67.3           |       |
| 1600.0                  | 73.0           |       | 71.8           |       | 70.6           |       | 69.0           |       |
| 2000.0                  | 74.2           |       | 73.4           |       | 72.2           |       | 70.2           |       |
| 2500.0                  | 75.4           |       | 74.0           |       | 73.2           |       | 71.3           |       |
| 3150.0                  | 76.3           |       | 75.0           |       | 73.9           |       | 72.1           |       |
| 4000.0                  | 76.3           |       | 75.3           |       | 74.4           |       | 71.9           |       |
| 5000.0                  | 76.6           |       | 75.1           |       | 74.0           |       | 71.7           |       |
| 6300.0                  | 77.5           |       | 75.5           |       | 74.4           |       | 72.1           |       |
| 8000.0                  | 77.0           |       | 75.8           |       | 73.8           |       | 71.7           |       |
| 10000.0                 | 77.2           |       | 75.0           |       | 73.4           |       | 70.9           |       |
| 12500.0                 | 76.6           |       | 74.9           |       | 72.9           |       | 70.5           |       |
| 16000.0                 | 76.4           |       | 74.6           |       | 72.5           |       | 69.7           |       |
| 20000.0                 | 75.5           |       | 73.7           |       | 71.6           |       | 68.5           |       |
| 25000.0                 | 74.6           |       | 72.9           |       | 71.0           |       | 67.1           |       |
| 31500.0                 | 73.7           |       | 72.3           |       | 70.2           |       | 65.8           |       |
| 40000.0                 | 73.0           |       | 71.9           |       | 69.0           |       | 64.3           |       |
|                         |                |       |                |       |                |       |                |       |
| OVERALL<br>SPL          | 88.0           |       | 86.5           |       | 85.1           |       | 82.7           |       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 7.66 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 126.00 DEG.F, CHAMBER TEMPERATURE = 70.50 DEG.F  
RELATIVE HUMIDITY = 61.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 32

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.539  
TEMPERATURE RATIO TR = 1.105  
MACH NUMBER MJ = 0.810  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.977  
JET DENSITY RATIO DJ/D0 = 1.024  
JET VELOCITY RATIO VJ/A0 = 0.800  
JET VELOCITY VJ = 903.6 FPS

TR/TJ = 1.131  
DR/D0 = 1.394  
DR/DJ = 1.361  
MASS FLOW = 1.500 POUNDS PER SECOND  
THRUST = 42.28 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 81.0                                  | 82.0                                  | 74.8                                  | 70.6                                  | 69.6                                  | 66.8                                  |
| 250.0                                  | 82.2                                  | 82.6                                  | 78.6                                  | 74.6                                  | 73.2                                  | 70.4                                  |
| 315.2                                  | 86.7                                  | 84.5                                  | 82.4                                  | 78.1                                  | 75.4                                  | 73.3                                  |
| 400.0                                  | 88.1                                  | 88.5                                  | 84.1                                  | 80.9                                  | 78.4                                  | 75.8                                  |
| 500.0                                  | 91.0                                  | 89.0                                  | 86.9                                  | 83.0                                  | 80.7                                  | 77.5                                  |
| 630.0                                  | 91.0                                  | 91.0                                  | 90.1                                  | 85.8                                  | 82.9                                  | 79.8                                  |
| 800.0                                  | 94.1                                  | 93.8                                  | 91.6                                  | 87.6                                  | 85.0                                  | 82.2                                  |
| 1000.0                                 | 93.1                                  | 94.0                                  | 92.6                                  | 89.0                                  | 86.5                                  | 84.0                                  |
| 1250.0                                 | 92.9                                  | 94.3                                  | 93.9                                  | 90.2                                  | 88.1                                  | 85.0                                  |
| 1600.0                                 | 90.4                                  | 92.3                                  | 92.7                                  | 90.1                                  | 88.7                                  | 86.3                                  |
| 2000.0                                 | 88.8                                  | 90.8                                  | 92.1                                  | 90.5                                  | 89.6                                  | 87.5                                  |
| 2500.0                                 | 86.8                                  | 88.8                                  | 91.0                                  | 90.0                                  | 89.9                                  | 87.7                                  |
| 3150.0                                 | 84.7                                  | 87.5                                  | 90.0                                  | 89.8                                  | 89.9                                  | 88.0                                  |
| 4000.0                                 | 84.8                                  | 86.7                                  | 89.2                                  | 88.9                                  | 90.0                                  | 88.2                                  |
| 5000.0                                 | 83.1                                  | 85.3                                  | 87.6                                  | 87.8                                  | 89.5                                  | 88.3                                  |
| 6300.0                                 | 83.4                                  | 84.5                                  | 86.6                                  | 87.1                                  | 89.2                                  | 88.1                                  |
| 8000.0                                 | 82.7                                  | 83.3                                  | 85.2                                  | 85.9                                  | 88.7                                  | 87.6                                  |
| 10000.0                                | 82.6                                  | 82.0                                  | 84.1                                  | 84.8                                  | 87.6                                  | 87.8                                  |
| 12500.0                                | 82.0                                  | 81.8                                  | 83.2                                  | 84.1                                  | 87.6                                  | 87.4                                  |
| 16000.0                                | 79.5                                  | 80.4                                  | 81.7                                  | 82.7                                  | 86.5                                  | 86.6                                  |
| 20000.0                                | 76.6                                  | 78.7                                  | 80.4                                  | 81.2                                  | 85.2                                  | 86.1                                  |
| 25000.0                                | 75.2                                  | 77.6                                  | 79.4                                  | 79.6                                  | 84.3                                  | 85.6                                  |
| 31500.0                                | 74.1                                  | 76.7                                  | 78.3                                  | 77.7                                  | 83.4                                  | 85.0                                  |
| 40000.0                                | 73.4                                  | 76.4                                  | 77.2                                  | 76.6                                  | 82.4                                  | 84.5                                  |
| OVERALL<br>SPL                         | 101.6                                 | 102.3                                 | 102.2                                 | 100.3                                 | 100.6                                 | 99.4                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 66.7                                  | 67.3                                  | 67.1                                  | 66.3                                   | 66.4                                   | 65.8                                   |
| 250.0                                  | 69.7                                  | 68.3                                  | 68.8                                  | 68.5                                   | 68.3                                   | 67.0                                   |
| 315.2                                  | 71.0                                  | 70.8                                  | 70.4                                  | 70.1                                   | 69.8                                   | 69.4                                   |
| 400.0                                  | 74.4                                  | 73.7                                  | 72.6                                  | 72.1                                   | 71.6                                   | 71.2                                   |
| 500.0                                  | 75.5                                  | 74.8                                  | 74.4                                  | 72.8                                   | 72.2                                   | 71.8                                   |
| 630.0                                  | 78.4                                  | 76.7                                  | 76.2                                  | 75.2                                   | 75.0                                   | 74.4                                   |
| 800.0                                  | 80.4                                  | 79.0                                  | 77.7                                  | 76.8                                   | 76.7                                   | 76.4                                   |
| 1000.0                                 | 81.8                                  | 80.1                                  | 79.0                                  | 78.2                                   | 77.7                                   | 77.2                                   |
| 1250.0                                 | 83.3                                  | 82.1                                  | 80.6                                  | 80.1                                   | 79.7                                   | 79.0                                   |
| 1600.0                                 | 84.3                                  | 82.7                                  | 81.6                                  | 80.6                                   | 80.4                                   | 79.8                                   |
| 2000.0                                 | 85.6                                  | 83.9                                  | 82.8                                  | 81.6                                   | 81.2                                   | 80.8                                   |
| 2500.0                                 | 86.1                                  | 84.6                                  | 83.2                                  | 82.5                                   | 82.4                                   | 81.9                                   |
| 3150.0                                 | 86.4                                  | 84.8                                  | 83.7                                  | 83.1                                   | 83.0                                   | 82.7                                   |
| 4000.0                                 | 86.9                                  | 85.6                                  | 84.4                                  | 83.5                                   | 83.4                                   | 83.0                                   |
| 5000.0                                 | 87.2                                  | 85.8                                  | 84.4                                  | 83.8                                   | 83.8                                   | 83.4                                   |
| 6300.0                                 | 87.4                                  | 86.2                                  | 84.6                                  | 84.3                                   | 84.1                                   | 84.2                                   |
| 8000.0                                 | 87.2                                  | 86.1                                  | 84.7                                  | 84.1                                   | 84.1                                   | 84.2                                   |
| 10000.0                                | 87.0                                  | 86.1                                  | 85.0                                  | 84.3                                   | 84.3                                   | 84.6                                   |
| 12500.0                                | 86.8                                  | 85.9                                  | 84.6                                  | 84.0                                   | 83.8                                   | 84.3                                   |
| 16000.0                                | 86.3                                  | 85.7                                  | 84.4                                  | 83.3                                   | 83.4                                   | 83.8                                   |
| 20000.0                                | 85.9                                  | 84.9                                  | 83.9                                  | 82.6                                   | 82.7                                   | 82.7                                   |
| 25000.0                                | 85.3                                  | 84.3                                  | 83.7                                  | 82.0                                   | 82.3                                   | 82.0                                   |
| 31500.0                                | 84.4                                  | 83.7                                  | 83.4                                  | 81.3                                   | 81.8                                   | 81.3                                   |
| 40000.0                                | 83.9                                  | 83.7                                  | 83.0                                  | 80.5                                   | 81.7                                   | 80.6                                   |
| OVERALL<br>SPL                         | 98.4                                  | 97.2                                  | 96.1                                  | 95.1                                   | 95.1                                   | 95.0                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 7.56 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 123.00 DEG.F, CHAMBER TEMPERATURE = 68.00 DEG.F  
RELATIVE HUMIDITY = 76.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 131

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.540  
TEMPERATURE RATIO TR = 1.104  
MACH NUMBER MJ = 0.810  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.976  
JET DENSITY RATIO DJ/D0 = 1.025  
JET VELOCITY RATIO VJ/A0 = 0.800  
JET VELOCITY VJ = 901.6 FPS

TR/TJ = 1.131  
DR/D0 = 1.395  
DR/DJ = 1.361  
MASS FLOW = 1.502 POUNDS PER SECOND  
THRUST = 42.31 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>Hz | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>120.0 |
|--|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 62.7                        |               | 65.2                        |               | 65.4                        |               | 65.6                        |                | 64.6                        |                | 62.6                        |                |
| 250.0                                  | 66.0                        |               | 66.5                        |               | 65.6                        |               | 65.0                        |                | 64.5                        |                | 63.6                        |                |
| 315.2                                  | 67.2                        |               | 67.7                        |               | 67.5                        |               | 66.3                        |                | 67.0                        |                | 66.1                        |                |
| 400.0                                  | 70.8                        |               | 70.2                        |               | 69.9                        |               | 69.2                        |                | 69.3                        |                | 69.4                        |                |
| 500.0                                  | 72.7                        |               | 72.3                        |               | 72.2                        |               | 72.1                        |                | 71.9                        |                | 70.7                        |                |
| 630.0                                  | 74.8                        |               | 74.1                        |               | 74.4                        |               | 73.7                        |                | 73.7                        |                | 73.0                        |                |
| 800.0                                  | 76.4                        |               | 76.6                        |               | 76.1                        |               | 75.0                        |                | 74.5                        |                | 73.8                        |                |
| 1000.0                                 | 78.7                        |               | 78.2                        |               | 77.0                        |               | 76.2                        |                | 75.4                        |                | 74.8                        |                |
| 1250.0                                 | 80.6                        |               | 79.7                        |               | 78.6                        |               | 77.8                        |                | 77.3                        |                | 76.3                        |                |
| 1600.0                                 | 81.6                        |               | 80.1                        |               | 79.0                        |               | 78.5                        |                | 78.2                        |                | 77.3                        |                |
| 2000.0                                 | 82.4                        |               | 81.3                        |               | 80.4                        |               | 79.8                        |                | 79.2                        |                | 78.5                        |                |
| 2500.0                                 | 82.9                        |               | 82.0                        |               | 81.3                        |               | 80.7                        |                | 80.3                        |                | 79.9                        |                |
| 3150.0                                 | 83.4                        |               | 82.3                        |               | 81.6                        |               | 81.4                        |                | 81.1                        |                | 80.5                        |                |
| 4000.0                                 | 83.8                        |               | 82.9                        |               | 82.3                        |               | 81.8                        |                | 81.4                        |                | 80.7                        |                |
| 5000.0                                 | 83.5                        |               | 83.2                        |               | 82.6                        |               | 81.7                        |                | 81.5                        |                | 80.7                        |                |
| 6300.0                                 | 83.7                        |               | 84.2                        |               | 83.0                        |               | 82.3                        |                | 82.1                        |                | 81.6                        |                |
| 8000.0                                 | 83.8                        |               | 84.6                        |               | 82.2                        |               | 82.2                        |                | 81.8                        |                | 81.0                        |                |
| 10000.0                                | 84.4                        |               | 84.9                        |               | 82.4                        |               | 82.3                        |                | 81.6                        |                | 80.8                        |                |
| 12500.0                                | 84.5                        |               | 83.3                        |               | 82.4                        |               | 81.9                        |                | 81.7                        |                | 80.9                        |                |
| 16000.0                                | 83.4                        |               | 83.4                        |               | 81.3                        |               | 81.6                        |                | 81.4                        |                | 80.7                        |                |
| 20000.0                                | 81.5                        |               | 83.3                        |               | 80.9                        |               | 80.7                        |                | 80.6                        |                | 80.4                        |                |
| 25000.0                                | 81.8                        |               | 82.2                        |               | 80.2                        |               | 80.1                        |                | 80.2                        |                | 79.8                        |                |
| 31500.0                                | 81.1                        |               | 81.9                        |               | 79.2                        |               | 79.1                        |                | 79.3                        |                | 79.3                        |                |
| 40000.0                                | 79.3                        |               | 81.3                        |               | 77.8                        |               | 78.4                        |                | 78.0                        |                | 78.9                        |                |
| OVERALL<br>SPL                         | 95.1                        |               | 95.1                        |               | 93.6                        |               | 93.2                        |                | 92.9                        |                | 92.3                        |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 63.7  |       | 63.0  | 62.8  |
| 250.0   | 64.7  |       | 63.9  | 64.1  |
| 315.2   | 66.9  |       | 65.3  | 65.4  |
| 400.0   | 69.4  |       | 67.4  | 66.6  |
| 500.0   | 70.9  |       | 69.4  | 68.7  |
| 630.0   | 72.7  |       | 71.6  | 70.2  |
| 800.0   | 72.9  |       | 72.1  | 71.3  |
| 1000.0  | 74.3  |       | 73.0  | 71.8  |
| 1250.0  | 75.5  |       | 74.6  | 73.3  |
| 1600.0  | 76.8  |       | 75.6  | 74.3  |
| 2000.0  | 78.0  |       | 77.2  | 76.3  |
| 2500.0  | 79.5  |       | 78.5  | 77.4  |
| 3150.0  | 79.9  |       | 79.2  | 77.7  |
| 4000.0  | 80.4  |       | 79.8  | 78.4  |
| 5000.0  | 80.5  |       | 79.4  | 78.3  |
| 6300.0  | 81.3  |       | 80.2  | 78.8  |
| 8000.0  | 81.2  |       | 80.4  | 78.4  |
| 10000.0 | 81.3  |       | 79.9  | 78.6  |
| 12500.0 | 80.8  |       | 79.8  | 77.6  |
| 16000.0 | 80.6  |       | 79.6  | 77.4  |
| 20000.0 | 79.9  |       | 78.7  | 76.5  |
| 25000.0 | 79.1  |       | 78.0  | 76.1  |
| 31500.0 | 78.2  |       | 77.2  | 75.3  |
| 40000.0 | 77.2  |       | 76.7  | 74.3  |
| OVERALL |       |       |       |       |
| SPL     | 92.0  |       | 91.0  | 89.4  |
|         |       |       |       | 87.6  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 10.10 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 145.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 33

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.711$   
TEMPERATURE RATIO  $TR = 1.137$   
MACH NUMBER  $MJ = 0.911$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.975$   
JET DENSITY RATIO  $DJ/D_0 = 1.025$   
JET VELOCITY RATIO  $VJ/A_0 = 0.900$   
JET VELOCITY  $VJ = 1017.0$  FPS

$TR/TJ = 1.166$   
 $DR/D_0 = 1.505$   
 $OR/DJ = 1.468$   
MASS FLOW = 1.688 POUNDS PER SECOND  
THRUST = 53.47 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>1 15.0 | MICRO<br>PHONE<br>NO. ANGLE<br>2 22.5 | MICRO<br>PHONE<br>NO. ANGLE<br>3 30.0 | MICRO<br>PHONE<br>NO. ANGLE<br>4 37.5 | MICRO<br>PHONE<br>NO. ANGLE<br>5 45.0 | MICRO<br>PHONE<br>NO. ANGLE<br>6 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 83.0                                  | 84.3                                  | 77.3                                  | 73.3                                  | 81.3                                  | 70.1                                  |
| 250.0                                  | 85.4                                  | 86.9                                  | 82.1                                  | 77.9                                  | 75.2                                  | 72.8                                  |
| 315.2                                  | 89.6                                  | 87.4                                  | 86.0                                  | 80.4                                  | 77.6                                  | 75.8                                  |
| 400.0                                  | 91.9                                  | 92.4                                  | 87.4                                  | 83.7                                  | 81.2                                  | 79.0                                  |
| 500.0                                  | 95.0                                  | 92.9                                  | 90.9                                  | 85.9                                  | 83.3                                  | 80.7                                  |
| 630.0                                  | 95.2                                  | 95.4                                  | 94.1                                  | 89.0                                  | 86.3                                  | 82.8                                  |
| 800.0                                  | 98.3                                  | 98.1                                  | 95.9                                  | 91.6                                  | 88.6                                  | 85.1                                  |
| 1000.0                                 | 98.3                                  | 99.0                                  | 97.5                                  | 93.3                                  | 90.5                                  | 87.3                                  |
| 1250.0                                 | 98.3                                  | 100.1                                 | 98.5                                  | 94.8                                  | 92.4                                  | 88.6                                  |
| 1600.0                                 | 96.8                                  | 98.8                                  | 98.1                                  | 94.6                                  | 92.7                                  | 89.5                                  |
| 2000.0                                 | 94.6                                  | 97.4                                  | 97.1                                  | 95.0                                  | 93.5                                  | 90.8                                  |
| 2500.0                                 | 91.8                                  | 95.1                                  | 95.5                                  | 94.3                                  | 93.6                                  | 91.6                                  |
| 3150.0                                 | 89.2                                  | 92.8                                  | 94.1                                  | 93.9                                  | 93.8                                  | 91.9                                  |
| 4000.0                                 | 88.5                                  | 91.6                                  | 92.9                                  | 93.3                                  | 94.2                                  | 92.2                                  |
| 5000.0                                 | 86.6                                  | 90.2                                  | 91.5                                  | 92.2                                  | 93.7                                  | 92.3                                  |
| 6300.0                                 | 86.1                                  | 89.0                                  | 90.1                                  | 91.2                                  | 93.1                                  | 92.5                                  |
| 8000.0                                 | 86.3                                  | 87.8                                  | 88.8                                  | 90.1                                  | 92.2                                  | 91.6                                  |
| 10000.0                                | 86.3                                  | 86.5                                  | 88.0                                  | 89.0                                  | 91.8                                  | 91.5                                  |
| 12500.0                                | 85.1                                  | 85.7                                  | 86.9                                  | 88.2                                  | 91.1                                  | 91.1                                  |
| 16000.0                                | 82.8                                  | 84.8                                  | 85.8                                  | 87.2                                  | 90.5                                  | 90.6                                  |
| 20000.0                                | 79.9                                  | 83.0                                  | 84.5                                  | 86.1                                  | 89.4                                  | 90.1                                  |
| 25000.0                                | 78.1                                  | 81.7                                  | 83.3                                  | 84.6                                  | 88.3                                  | 89.5                                  |
| 31500.0                                | 77.1                                  | 80.9                                  | 81.9                                  | 83.1                                  | 87.4                                  | 89.0                                  |
| 40000.0                                | 75.6                                  | 81.0                                  | 80.5                                  | 82.2                                  | 86.2                                  | 88.4                                  |
| OVERALL<br>SPL                         | 106.3                                 | 107.5                                 | 106.7                                 | 104.6                                 | 104.5                                 | 103.2                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 69.5                                  | 70.0                                  | 69.8                                  | 69.9                                   | 69.0                                   | 68.6                                   |
| 250.0                                  | 72.2                                  | 72.6                                  | 71.2                                  | 71.3                                   | 70.3                                   | 70.1                                   |
| 315.2                                  | 74.1                                  | 74.2                                  | 73.8                                  | 72.8                                   | 72.5                                   | 72.3                                   |
| 400.0                                  | 77.5                                  | 76.9                                  | 76.2                                  | 75.0                                   | 75.4                                   | 74.4                                   |
| 500.0                                  | 79.0                                  | 77.9                                  | 77.4                                  | 76.4                                   | 75.9                                   | 75.5                                   |
| 630.0                                  | 81.8                                  | 80.4                                  | 79.6                                  | 78.8                                   | 78.5                                   | 77.5                                   |
| 800.0                                  | 83.6                                  | 82.3                                  | 81.2                                  | 80.4                                   | 79.8                                   | 79.5                                   |
| 1000.0                                 | 85.4                                  | 84.1                                  | 82.7                                  | 81.8                                   | 81.0                                   | 80.7                                   |
| 1250.0                                 | 86.8                                  | 85.6                                  | 84.5                                  | 83.4                                   | 82.7                                   | 82.4                                   |
| 1600.0                                 | 88.1                                  | 86.5                                  | 85.2                                  | 84.2                                   | 83.7                                   | 83.2                                   |
| 2000.0                                 | 89.4                                  | 87.9                                  | 86.4                                  | 85.5                                   | 85.0                                   | 84.3                                   |
| 2500.0                                 | 89.9                                  | 88.5                                  | 87.2                                  | 86.0                                   | 85.7                                   | 85.4                                   |
| 3150.0                                 | 90.4                                  | 89.0                                  | 87.6                                  | 86.7                                   | 86.2                                   | 85.9                                   |
| 4000.0                                 | 91.1                                  | 89.8                                  | 88.6                                  | 87.2                                   | 86.9                                   | 86.7                                   |
| 5000.0                                 | 91.6                                  | 90.3                                  | 88.7                                  | 87.8                                   | 87.6                                   | 87.3                                   |
| 6300.0                                 | 91.5                                  | 90.5                                  | 88.8                                  | 88.3                                   | 87.9                                   | 88.2                                   |
| 8000.0                                 | 91.5                                  | 90.3                                  | 88.8                                  | 87.7                                   | 88.0                                   | 87.9                                   |
| 10000.0                                | 91.4                                  | 90.4                                  | 88.6                                  | 87.8                                   | 87.9                                   | 88.2                                   |
| 12500.0                                | 91.4                                  | 90.4                                  | 88.8                                  | 87.7                                   | 88.0                                   | 88.2                                   |
| 16000.0                                | 91.0                                  | 90.3                                  | 88.7                                  | 87.4                                   | 87.9                                   | 88.1                                   |
| 20000.0                                | 90.5                                  | 89.7                                  | 88.4                                  | 86.8                                   | 87.3                                   | 87.3                                   |
| 25000.0                                | 89.9                                  | 89.2                                  | 88.2                                  | 86.2                                   | 86.8                                   | 86.6                                   |
| 31500.0                                | 89.2                                  | 88.8                                  | 87.9                                  | 85.6                                   | 86.4                                   | 85.9                                   |
| 40000.0                                | 88.6                                  | 88.7                                  | 87.4                                  | 84.7                                   | 86.4                                   | 85.2                                   |
| OVERALL<br>SPL                         | 102.6                                 | 101.6                                 | 100.2                                 | 98.9                                   | 99.0                                   | 98.9                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 9.97 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 141.00 DEG.F, CHAMBER TEMPERATURE = 68.00 DEG.F  
RELATIVE HUMIDITY = 76.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 132

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.712$   
TEMPERATURE RATIO  $T_r = 1.138$   
MACH NUMBER  $M_J = 0.911$   
JET STATIC TEMPERATURE RATIO  $T_{J/T_0} = 0.976$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 1.024$   
JET VELOCITY RATIO  $V_J/A_0 = 0.900$   
JET VELOCITY  $V_J = 1014.1$  FPS

$T_r/T_J = 1.166$   
 $D_r/D_0 = 1.504$   
 $D_r/D_J = 1.468$   
MASS FLOW = 1.689 POUNDS PER SECOND  
THRUST = 53.52 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO |       |
| CENTER  | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  | 13    | 105.0 | 14    | 112.5 | 15    | 120.0 |
| 200.0   | 66.3  |       | 68.0  |       | 68.9  |       | 68.6  |       | 66.5  |       | 65.5  |       |
| 250.0   | 69.0  |       | 69.3  |       | 68.5  |       | 67.1  |       | 67.0  |       | 66.0  |       |
| 315.2   | 69.9  |       | 70.6  |       | 70.2  |       | 69.5  |       | 69.4  |       | 69.0  |       |
| 400.0   | 72.8  |       | 73.1  |       | 72.4  |       | 71.7  |       | 71.8  |       | 72.3  |       |
| 500.0   | 75.3  |       | 75.2  |       | 75.2  |       | 74.9  |       | 74.5  |       | 74.2  |       |
| 630.0   | 77.5  |       | 77.0  |       | 77.4  |       | 77.3  |       | 76.5  |       | 76.3  |       |
| 800.0   | 79.3  |       | 79.6  |       | 79.5  |       | 78.1  |       | 78.0  |       | 77.2  |       |
| 1000.0  | 81.3  |       | 81.3  |       | 80.4  |       | 79.6  |       | 78.9  |       | 78.4  |       |
| 1250.0  | 83.7  |       | 82.9  |       | 82.2  |       | 81.4  |       | 80.4  |       | 80.1  |       |
| 1600.0  | 84.7  |       | 83.7  |       | 82.9  |       | 81.9  |       | 81.3  |       | 80.6  |       |
| 2000.0  | 85.2  |       | 84.8  |       | 83.9  |       | 83.3  |       | 82.5  |       | 82.0  |       |
| 2500.0  | 86.2  |       | 85.3  |       | 84.3  |       | 83.9  |       | 83.4  |       | 82.7  |       |
| 3150.0  | 86.7  |       | 85.8  |       | 85.1  |       | 84.8  |       | 83.9  |       | 83.4  |       |
| 4000.0  | 86.8  |       | 86.7  |       | 85.9  |       | 85.4  |       | 84.7  |       | 83.9  |       |
| 5000.0  | 86.9  |       | 86.9  |       | 86.3  |       | 85.3  |       | 84.9  |       | 84.1  |       |
| 6300.0  | 87.2  |       | 87.8  |       | 86.8  |       | 85.9  |       | 85.5  |       | 85.0  |       |
| 8000.0  | 87.5  |       | 88.4  |       | 86.1  |       | 86.1  |       | 85.4  |       | 84.8  |       |
| 10000.0 | 88.1  |       | 88.5  |       | 86.3  |       | 86.1  |       | 85.8  |       | 85.0  |       |
| 12500.0 | 88.3  |       | 87.3  |       | 86.5  |       | 86.1  |       | 85.7  |       | 84.9  |       |
| 16000.0 | 87.2  |       | 87.4  |       | 85.5  |       | 85.8  |       | 85.5  |       | 85.0  |       |
| 20000.0 | 85.6  |       | 87.5  |       | 85.3  |       | 85.2  |       | 84.7  |       | 84.5  |       |
| 25000.0 | 85.8  |       | 86.3  |       | 84.9  |       | 84.5  |       | 84.3  |       | 84.0  |       |
| 31500.0 | 85.0  |       | 86.1  |       | 84.2  |       | 83.7  |       | 83.5  |       | 83.4  |       |
| 40000.0 | 83.6  |       | 85.5  |       | 83.5  |       | 83.1  |       | 82.2  |       | 83.0  |       |
| OVERALL |       |       |       |       |       |       |       |       |       |       |       |       |
| SPL     | 98.7  |       | 98.8  |       | 97.5  |       | 97.0  |       | 96.5  |       | 96.0  |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 65.0                        | 65.4                        | 66.2                        | 66.7                        |
| 250.0                                  | 65.9                        | 66.1                        | 66.8                        | 66.6                        |
| 315.2                                  | 68.7                        | 68.3                        | 67.8                        | 67.7                        |
| 400.0                                  | 71.6                        | 70.4                        | 69.6                        | 69.2                        |
| 500.0                                  | 74.0                        | 72.9                        | 71.8                        | 71.0                        |
| 630.0                                  | 76.3                        | 75.0                        | 73.6                        | 71.8                        |
| 800.0                                  | 76.6                        | 75.6                        | 74.7                        | 73.3                        |
| 1000.0                                 | 77.7                        | 76.3                        | 75.4                        | 74.1                        |
| 1250.0                                 | 79.7                        | 78.4                        | 77.2                        | 75.4                        |
| 1600.0                                 | 80.4                        | 79.4                        | 78.2                        | 77.4                        |
| 2000.0                                 | 81.8                        | 81.1                        | 79.9                        | 78.6                        |
| 2500.0                                 | 82.6                        | 81.9                        | 80.7                        | 79.6                        |
| 3150.0                                 | 83.4                        | 82.6                        | 81.4                        | 80.3                        |
| 4000.0                                 | 84.1                        | 83.2                        | 82.4                        | 80.9                        |
| 5000.0                                 | 84.4                        | 83.5                        | 82.7                        | 81.4                        |
| 6300.0                                 | 85.2                        | 84.6                        | 83.6                        | 82.5                        |
| 8000.0                                 | 85.4                        | 85.2                        | 83.8                        | 82.4                        |
| 10000.0                                | 85.6                        | 85.2                        | 83.9                        | 82.2                        |
| 12500.0                                | 85.6                        | 85.1                        | 83.6                        | 81.9                        |
| 16000.0                                | 85.4                        | 84.7                        | 83.4                        | 80.9                        |
| 20000.0                                | 84.6                        | 83.9                        | 82.4                        | 79.6                        |
| 25000.0                                | 84.0                        | 83.0                        | 81.6                        | 78.2                        |
| 31500.0                                | 82.7                        | 81.8                        | 80.5                        | 76.4                        |
| 40000.0                                | 81.8                        | 81.1                        | 79.2                        | 74.6                        |
| OVERALL<br>SPL                         | 96.1                        | 95.4                        | 94.2                        | 92.4                        |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.87 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 312.00 DEG.F, CHAMBER TEMPERATURE = 77.00 DEG.F  
RELATIVE HUMIDITY = 56.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 26

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.061$   
TEMPERATURE RATIO  $T_R = 1.438$   
MACH NUMBER  $M_J = 0.294$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.414$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.707$   
JET VELOCITY RATIO  $V_J/A_0 = 0.349$   
JET VELOCITY  $V_J = 397.0$  FPS

$T_R/T_J = 1.017$   
 $D_R/D_0 = 0.738$   
 $D_R/D_J = 1.044$   
MASS FLOW = 0.453 POUNDS PER SECOND  
THRUST = 5.57 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 58.6                                  | 61.2                                  | 54.4                                  | 52.4                                  | 52.4                                  | 51.0                                  |
| 250.0                                  | 58.8                                  | 61.2                                  | 57.3                                  | 55.2                                  | 55.4                                  | 53.1                                  |
| 315.2                                  | 60.4                                  | 61.5                                  | 59.9                                  | 57.2                                  | 56.8                                  | 55.4                                  |
| 400.0                                  | 62.9                                  | 64.3                                  | 60.8                                  | 59.0                                  | 58.7                                  | 57.5                                  |
| 500.0                                  | 65.3                                  | 63.5                                  | 62.7                                  | 60.0                                  | 60.1                                  | 58.8                                  |
| 630.0                                  | 63.0                                  | 63.7                                  | 63.3                                  | 61.3                                  | 61.5                                  | 59.9                                  |
| 800.0                                  | 65.5                                  | 65.0                                  | 63.8                                  | 62.2                                  | 62.2                                  | 60.7                                  |
| 1000.0                                 | 63.1                                  | 64.5                                  | 64.2                                  | 62.4                                  | 62.1                                  | 61.3                                  |
| 1250.0                                 | 62.7                                  | 64.4                                  | 64.4                                  | 62.7                                  | 63.0                                  | 61.6                                  |
| 1600.0                                 | 60.5                                  | 63.0                                  | 63.3                                  | 62.0                                  | 62.6                                  | 61.7                                  |
| 2000.0                                 | 58.2                                  | 61.7                                  | 62.5                                  | 61.6                                  | 62.0                                  | 61.6                                  |
| 2500.0                                 | 54.8                                  | 59.7                                  | 60.8                                  | 60.4                                  | 61.5                                  | 61.0                                  |
| 3150.0                                 | 53.1                                  | 57.2                                  | 59.5                                  | 59.6                                  | 60.7                                  | 60.1                                  |
| 4000.0                                 | 53.9                                  | 56.3                                  | 57.9                                  | 58.6                                  | 60.5                                  | 59.3                                  |
| 5000.0                                 | 52.6                                  | 55.0                                  | 56.2                                  | 57.0                                  | 59.7                                  | 58.8                                  |
| 6300.0                                 | 52.2                                  | 53.5                                  | 54.4                                  | 55.9                                  | 58.6                                  | 57.9                                  |
| 8000.0                                 | 52.0                                  | 51.8                                  | 53.2                                  | 54.5                                  | 57.6                                  | 56.9                                  |
| 10000.0                                | 52.4                                  | 50.7                                  | 52.2                                  | 53.5                                  | 57.1                                  | 56.4                                  |
| 12500.0                                | 52.2                                  | 50.7                                  | 51.1                                  | 52.6                                  | 56.2                                  | 55.8                                  |
| 16000.0                                | 50.2                                  | 50.3                                  | 50.3                                  | 51.7                                  | 55.3                                  | 55.2                                  |
| 20000.0                                | 49.1                                  | 49.7                                  | 49.6                                  | 50.9                                  | 54.5                                  | 54.6                                  |
| 25000.0                                | 49.2                                  | 51.0                                  | 49.8                                  | 50.6                                  | 54.1                                  | 54.4                                  |
| 31500.0                                | 50.2                                  | 53.1                                  | 50.4                                  | 51.0                                  | 55.0                                  | 54.6                                  |
| 40000.0                                | 52.4                                  | 56.3                                  | 52.1                                  | 52.5                                  | 57.6                                  | 54.8                                  |
| OVERALL<br>SPL                         | 73.3                                  | 74.4                                  | 73.6                                  | 72.4                                  | 73.3                                  | 72.3                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 49.7                                  | 51.7                                  | 49.0                                  | 49.3                                   | 51.9                                   | 50.6                                   |
| 250.0                                  | 52.1                                  | 51.4                                  | 50.4                                  | 50.1                                   | 49.7                                   | 49.2                                   |
| 315.2                                  | 53.5                                  | 53.5                                  | 52.6                                  | 51.8                                   | 52.0                                   | 51.2                                   |
| 400.0                                  | 56.1                                  | 55.0                                  | 53.8                                  | 52.8                                   | 52.6                                   | 51.9                                   |
| 500.0                                  | 57.4                                  | 56.6                                  | 55.8                                  | 54.8                                   | 54.5                                   | 53.1                                   |
| 630.0                                  | 58.5                                  | 57.9                                  | 57.0                                  | 56.0                                   | 55.5                                   | 54.8                                   |
| 800.0                                  | 59.6                                  | 58.8                                  | 57.7                                  | 56.7                                   | 56.4                                   | 55.5                                   |
| 1000.0                                 | 60.1                                  | 59.2                                  | 58.2                                  | 57.6                                   | 57.2                                   | 56.2                                   |
| 1250.0                                 | 60.5                                  | 59.8                                  | 59.3                                  | 58.4                                   | 57.7                                   | 56.9                                   |
| 1600.0                                 | 60.7                                  | 59.6                                  | 58.9                                  | 58.3                                   | 58.1                                   | 57.3                                   |
| 2000.0                                 | 60.6                                  | 60.0                                  | 59.3                                  | 58.4                                   | 58.1                                   | 57.2                                   |
| 2500.0                                 | 60.0                                  | 59.6                                  | 58.8                                  | 58.0                                   | 57.6                                   | 57.1                                   |
| 3150.0                                 | 59.6                                  | 59.2                                  | 58.4                                  | 58.1                                   | 57.4                                   | 57.1                                   |
| 4000.0                                 | 59.2                                  | 58.9                                  | 58.1                                  | 57.6                                   | 57.0                                   | 56.7                                   |
| 5000.0                                 | 58.7                                  | 58.5                                  | 57.5                                  | 57.3                                   | 56.9                                   | 56.6                                   |
| 6300.0                                 | 57.9                                  | 57.8                                  | 56.5                                  | 56.7                                   | 56.3                                   | 56.2                                   |
| 8000.0                                 | 56.9                                  | 57.0                                  | 55.9                                  | 55.7                                   | 55.7                                   | 55.7                                   |
| 10000.0                                | 56.4                                  | 56.3                                  | 55.0                                  | 55.0                                   | 55.0                                   | 55.4                                   |
| 12500.0                                | 55.8                                  | 55.8                                  | 54.7                                  | 54.7                                   | 54.5                                   | 55.0                                   |
| 16000.0                                | 55.1                                  | 55.3                                  | 54.5                                  | 54.0                                   | 54.2                                   | 54.5                                   |
| 20000.0                                | 54.5                                  | 54.6                                  | 53.9                                  | 53.2                                   | 53.6                                   | 53.6                                   |
| 25000.0                                | 54.2                                  | 54.1                                  | 53.9                                  | 52.8                                   | 53.5                                   | 53.1                                   |
| 31500.0                                | 54.4                                  | 54.0                                  | 53.9                                  | 53.0                                   | 53.8                                   | 52.9                                   |
| 40000.0                                | 58.5                                  | 54.4                                  | 54.3                                  | 53.5                                   | 55.1                                   | 53.4                                   |
| OVERALL<br>SPL                         | 71.7                                  | 71.1                                  | 70.3                                  | 69.7                                   | 69.5                                   | 68.9                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.86 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 295.00 DEG.F, CHAMBER TEMPERATURE = 62.00 DEG.F  
RELATIVE HUMIDITY = 56.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 234

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.861  
TEMPERATURE RATIO TR = 1.446  
MACH NUMBER MJ = 0.292  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.423  
JET DENSITY RATIO DJ/D0 = 0.703  
JET VELOCITY RATIO VJ/A0 = 0.349  
JET VELOCITY VJ = 390.4 FPS

TR/TJ = 1.017  
DR/D0 = 0.733  
DR/DJ = 1.043  
MASS FLOW = 0.449 POUNDS PER SECOND  
THRUST = 5.51 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. | ANGLE | MICRO<br>PHONE<br>NO. | ANGLE | MICRO<br>PHONE<br>NO. | ANGLE | MICRO<br>PHONE<br>NO. | ANGLE | MICRO<br>PHONE<br>NO. | ANGLE | MICRO<br>PHONE<br>NO. | ANGLE |
|--|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|
|  | 10                    | 82.5  | 11                    | 90.0  | 12                    | 97.5  | 13                    | 105.0 | 14                    | 112.5 | 15                    | 120.0 |
| 200.0                                  | 47.0                  |       | 47.7                  |       | 50.1                  |       | 47.8                  |       | 47.3                  |       | 50.1                  |       |
| 250.0                                  | 49.9                  |       | 49.5                  |       | 48.7                  |       | 48.8                  |       | 48.8                  |       | 49.0                  |       |
| 315.2                                  | 51.8                  |       | 52.2                  |       | 52.1                  |       | 51.7                  |       | 51.3                  |       | 51.7                  |       |
| 400.0                                  | 54.4                  |       | 54.7                  |       | 53.3                  |       | 53.0                  |       | 52.6                  |       | 53.0                  |       |
| 500.0                                  | 56.3                  |       | 56.0                  |       | 55.1                  |       | 54.9                  |       | 53.5                  |       | 53.3                  |       |
| 630.0                                  | 58.2                  |       | 57.0                  |       | 56.5                  |       | 55.6                  |       | 54.4                  |       | 54.7                  |       |
| 800.0                                  | 59.0                  |       | 58.3                  |       | 56.4                  |       | 56.2                  |       | 55.7                  |       | 55.7                  |       |
| 1000.0                                 | 59.6                  |       | 57.8                  |       | 57.0                  |       | 56.3                  |       | 55.8                  |       | 55.6                  |       |
| 1250.0                                 | 59.7                  |       | 58.4                  |       | 57.7                  |       | 57.4                  |       | 56.6                  |       | 56.1                  |       |
| 1600.0                                 | 59.4                  |       | 58.5                  |       | 57.3                  |       | 57.2                  |       | 56.6                  |       | 55.8                  |       |
| 2000.0                                 | 59.2                  |       | 58.6                  |       | 57.8                  |       | 57.5                  |       | 56.8                  |       | 56.6                  |       |
| 2500.0                                 | 58.8                  |       | 57.8                  |       | 57.0                  |       | 57.3                  |       | 57.1                  |       | 56.3                  |       |
| 3150.0                                 | 58.3                  |       | 57.4                  |       | 57.0                  |       | 57.2                  |       | 56.8                  |       | 56.2                  |       |
| 4000.0                                 | 57.9                  |       | 57.3                  |       | 56.8                  |       | 57.0                  |       | 56.5                  |       | 55.9                  |       |
| 5000.0                                 | 56.9                  |       | 56.8                  |       | 56.4                  |       | 56.2                  |       | 56.2                  |       | 55.5                  |       |
| 6300.0                                 | 56.4                  |       | 56.8                  |       | 56.1                  |       | 56.1                  |       | 56.1                  |       | 55.5                  |       |
| 8000.0                                 | 56.3                  |       | 57.0                  |       | 54.5                  |       | 55.4                  |       | 55.3                  |       | 54.9                  |       |
| 10000.0                                | 56.4                  |       | 56.5                  |       | 54.3                  |       | 54.7                  |       | 54.9                  |       | 54.3                  |       |
| 12500.0                                | 56.2                  |       | 55.3                  |       | 54.4                  |       | 54.5                  |       | 54.7                  |       | 54.0                  |       |
| 16000.0                                | 55.7                  |       | 55.3                  |       | 54.6                  |       | 54.7                  |       | 55.3                  |       | 54.1                  |       |
| 20000.0                                | 53.5                  |       | 55.2                  |       | 53.7                  |       | 53.7                  |       | 53.7                  |       | 52.9                  |       |
| 25000.0                                | 54.0                  |       | 54.2                  |       | 53.0                  |       | 53.3                  |       | 53.4                  |       | 52.8                  |       |
| 31500.0                                | 54.1                  |       | 54.8                  |       | 53.1                  |       | 53.8                  |       | 53.6                  |       | 53.1                  |       |
| 40000.0                                | 53.6                  |       | 54.8                  |       | 53.3                  |       | 54.8                  |       | 53.7                  |       | 54.0                  |       |
| OVERALL<br>SPL                         | 70.6                  |       | 70.2                  |       | 69.2                  |       | 69.2                  |       | 68.8                  |       | 68.4                  |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 53.6                                    | 56.0                                    | 50.8                                    | 51.4                                    |
| 250.0                                  | 47.7                                    | 48.1                                    | 48.2                                    | 47.9                                    |
| 315.2                                  | 49.9                                    | 51.5                                    | 50.2                                    | 50.7                                    |
| 400.0                                  | 52.7                                    | 51.5                                    | 51.5                                    | 50.6                                    |
| 500.0                                  | 53.3                                    | 52.2                                    | 51.9                                    | 51.2                                    |
| 630.0                                  | 54.3                                    | 53.4                                    | 52.9                                    | 51.4                                    |
| 800.0                                  | 54.6                                    | 53.6                                    | 53.6                                    | 52.2                                    |
| 1000.0                                 | 55.0                                    | 53.7                                    | 53.8                                    | 52.3                                    |
| 1250.0                                 | 55.6                                    | 54.7                                    | 53.6                                    | 52.2                                    |
| 1600.0                                 | 55.6                                    | 54.1                                    | 53.0                                    | 51.5                                    |
| 2000.0                                 | 56.0                                    | 54.8                                    | 53.3                                    | 50.8                                    |
| 2500.0                                 | 55.6                                    | 54.6                                    | 52.9                                    | 50.2                                    |
| 3150.0                                 | 55.7                                    | 54.8                                    | 52.5                                    | 50.3                                    |
| 4000.0                                 | 55.6                                    | 54.1                                    | 52.5                                    | 49.5                                    |
| 5000.0                                 | 55.1                                    | 53.5                                    | 51.8                                    | 48.8                                    |
| 6300.0                                 | 55.0                                    | 53.0                                    | 51.2                                    | 48.4                                    |
| 8000.0                                 | 54.1                                    | 52.5                                    | 50.2                                    | 47.4                                    |
| 10000.0                                | 53.7                                    | 51.7                                    | 49.4                                    | 46.1                                    |
| 12500.0                                | 53.2                                    | 51.1                                    | 48.5                                    | 45.5                                    |
| 16000.0                                | 54.4                                    | 51.3                                    | 50.5                                    | 48.5                                    |
| 20000.0                                | 52.7                                    | 49.5                                    | 47.8                                    | 44.7                                    |
| 25000.0                                | 51.7                                    | 48.3                                    | 46.2                                    | 42.6                                    |
| 31500.0                                | 51.9                                    | 49.0                                    | 46.3                                    | 46.7                                    |
| 40000.0                                | 51.7                                    | 49.0                                    | 45.6                                    | 45.6                                    |
| OVERALL<br>SPL                         | 67.9                                    | 66.6                                    | 65.2                                    | 63.5                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.13 PSI; ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 317.00 DEG.F; CHAMBER TEMPERATURE = 76.00 DEG.F  
RELATIVE HUMIDITY = 53.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 34

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.080$   
TEMPERATURE RATIO  $TR = 1.450$   
MACH NUMBER  $MJ = 0.334$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.419$   
JET DENSITY RATIO  $DJ/DO = 0.705$   
JET VELOCITY RATIO  $VJ/AO = 0.397$   
JET VELOCITY  $VJ = 451.1$  FPS

$TR/TJ = 1.022$   
 $OR/DO = 0.745$   
 $OR/DJ = 1.057$   
MASS FLOW = 0.513 POUNDS PER SECOND  
THRUST = 7.18 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 60.7                                  | 62.2                                  | 56.1                                  | 55.7                                  | 54.4                                  | 52.8                                  |
| 250.0                                  | 62.8                                  | 62.6                                  | 60.6                                  | 57.9                                  | 57.7                                  | 55.8                                  |
| 315.2                                  | 66.1                                  | 64.4                                  | 64.7                                  | 60.8                                  | 60.3                                  | 58.9                                  |
| 400.0                                  | 68.1                                  | 67.6                                  | 64.8                                  | 62.7                                  | 62.0                                  | 60.6                                  |
| 500.0                                  | 70.1                                  | 67.2                                  | 66.6                                  | 63.6                                  | 63.6                                  | 61.6                                  |
| 630.0                                  | 68.1                                  | 68.0                                  | 67.8                                  | 65.6                                  | 65.0                                  | 63.4                                  |
| 800.0                                  | 69.8                                  | 69.0                                  | 68.5                                  | 66.1                                  | 66.1                                  | 64.3                                  |
| 1000.0                                 | 68.6                                  | 68.7                                  | 68.9                                  | 66.5                                  | 66.7                                  | 65.6                                  |
| 1250.0                                 | 67.8                                  | 68.6                                  | 69.6                                  | 67.7                                  | 67.5                                  | 66.0                                  |
| 1600.0                                 | 65.0                                  | 67.3                                  | 68.3                                  | 66.9                                  | 67.3                                  | 66.2                                  |
| 2000.0                                 | 63.3                                  | 66.0                                  | 67.4                                  | 66.7                                  | 67.4                                  | 66.2                                  |
| 2500.0                                 | 60.8                                  | 64.0                                  | 66.1                                  | 65.7                                  | 66.7                                  | 65.7                                  |
| 3150.0                                 | 58.6                                  | 61.8                                  | 64.4                                  | 64.8                                  | 65.9                                  | 65.0                                  |
| 4000.0                                 | 58.5                                  | 60.9                                  | 63.3                                  | 63.9                                  | 65.5                                  | 64.5                                  |
| 5000.0                                 | 56.6                                  | 59.5                                  | 61.5                                  | 62.4                                  | 64.5                                  | 63.8                                  |
| 6300.0                                 | 56.8                                  | 57.7                                  | 59.6                                  | 61.0                                  | 63.4                                  | 62.9                                  |
| 8000.0                                 | 56.3                                  | 55.7                                  | 58.1                                  | 59.7                                  | 62.3                                  | 61.6                                  |
| 10000.0                                | 56.4                                  | 53.9                                  | 56.8                                  | 58.4                                  | 61.4                                  | 60.9                                  |
| 12500.0                                | 56.3                                  | 53.7                                  | 55.5                                  | 57.3                                  | 60.8                                  | 60.3                                  |
| 16000.0                                | 54.2                                  | 53.3                                  | 54.5                                  | 56.1                                  | 59.9                                  | 59.6                                  |
| 20000.0                                | 52.2                                  | 52.3                                  | 53.3                                  | 54.9                                  | 58.9                                  | 58.8                                  |
| 25000.0                                | 51.7                                  | 53.9                                  | 52.9                                  | 54.1                                  | 58.2                                  | 58.4                                  |
| 31500.0                                | 52.8                                  | 56.3                                  | 52.7                                  | 53.5                                  | 58.0                                  | 58.0                                  |
| 40000.0                                | 55.2                                  | 60.0                                  | 53.3                                  | 54.0                                  | 58.3                                  | 57.9                                  |
| OVERALL<br>SPL                         | 78.1                                  | 78.1                                  | 78.3                                  | 77.0                                  | 77.7                                  | 76.6                                  |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 52.1                                  | 53.3                                  | 51.2                                  | 51.0                                   | 52.4                                   | 52.1                                   |
| 250.0                                  | 54.5                                  | 53.7                                  | 52.9                                  | 52.1                                   | 51.8                                   | 51.6                                   |
| 315.2                                  | 57.7                                  | 56.1                                  | 55.5                                  | 54.9                                   | 54.8                                   | 54.7                                   |
| 400.0                                  | 59.7                                  | 57.5                                  | 56.3                                  | 56.1                                   | 55.0                                   | 54.8                                   |
| 500.0                                  | 61.3                                  | 59.4                                  | 58.1                                  | 57.5                                   | 57.4                                   | 56.2                                   |
| 630.0                                  | 62.5                                  | 60.7                                  | 60.1                                  | 59.6                                   | 58.9                                   | 58.4                                   |
| 800.0                                  | 63.6                                  | 62.3                                  | 61.0                                  | 60.1                                   | 60.1                                   | 59.4                                   |
| 1000.0                                 | 64.4                                  | 62.7                                  | 62.1                                  | 61.3                                   | 61.0                                   | 60.1                                   |
| 1250.0                                 | 65.2                                  | 63.9                                  | 62.9                                  | 62.6                                   | 62.5                                   | 61.2                                   |
| 1600.0                                 | 65.5                                  | 63.7                                  | 63.1                                  | 62.5                                   | 62.2                                   | 61.6                                   |
| 2000.0                                 | 65.7                                  | 64.4                                  | 63.5                                  | 62.8                                   | 62.5                                   | 61.9                                   |
| 2500.0                                 | 65.4                                  | 64.0                                  | 63.3                                  | 62.7                                   | 62.6                                   | 61.7                                   |
| 3150.0                                 | 65.1                                  | 63.7                                  | 63.2                                  | 62.7                                   | 62.5                                   | 62.1                                   |
| 4000.0                                 | 64.6                                  | 63.6                                  | 63.1                                  | 62.3                                   | 62.2                                   | 61.8                                   |
| 5000.0                                 | 64.2                                  | 63.2                                  | 62.5                                  | 62.2                                   | 62.2                                   | 61.8                                   |
| 6300.0                                 | 63.5                                  | 62.5                                  | 61.7                                  | 61.5                                   | 61.6                                   | 61.4                                   |
| 8000.0                                 | 62.4                                  | 61.6                                  | 60.9                                  | 60.5                                   | 60.9                                   | 60.8                                   |
| 10000.0                                | 61.8                                  | 60.9                                  | 60.1                                  | 60.1                                   | 60.2                                   | 60.5                                   |
| 12500.0                                | 61.3                                  | 60.2                                  | 59.9                                  | 59.4                                   | 59.7                                   | 60.0                                   |
| 16000.0                                | 60.8                                  | 59.8                                  | 59.5                                  | 58.6                                   | 59.3                                   | 59.3                                   |
| 20000.0                                | 60.2                                  | 58.8                                  | 58.8                                  | 57.6                                   | 58.5                                   | 58.1                                   |
| 25000.0                                | 59.9                                  | 58.1                                  | 58.4                                  | 56.9                                   | 57.8                                   | 57.2                                   |
| 31500.0                                | 59.8                                  | 57.5                                  | 58.0                                  | 56.2                                   | 57.6                                   | 56.5                                   |
| 40000.0                                | 60.9                                  | 57.5                                  | 57.8                                  | 55.9                                   | 58.1                                   | 56.2                                   |
| OVERALL<br>SPL                         | 76.5                                  | 75.2                                  | 74.5                                  | 73.9                                   | 73.9                                   | 73.4                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.13 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 299.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 210

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.080  
TEMPERATURE RATIO TR = 1.465  
MACH NUMBER MJ = 0.334  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.434  
JET DENSITY RATIO DJ/D0 = 0.697  
JET VELOCITY RATIO VJ/A0 = 0.400  
JET VELOCITY VJ = 446.1 FPS

TR/TJ = 1.022  
DR/D0 = 0.737  
DR/DJ = 1.057  
MASS FLOW = 0.511 POUNDS PER SECOND  
THRUST = 7.19 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|--|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
|  | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|  | 10             | 82.5  | 11             | 90.0  | 12             | 97.5  | 13             | 105.0 | 14             | 112.5 | 15             | 120.0 |
| 200.0                                  | 50.1           |       | 52.6           |       | 53.8           |       | 53.4           |       | 52.3           |       | 52.9           |       |
| 250.0                                  | 53.7           |       | 55.0           |       | 54.6           |       | 53.0           |       | 51.9           |       | 52.2           |       |
| 315.2                                  | 56.7           |       | 56.6           |       | 56.3           |       | 55.6           |       | 55.0           |       | 54.0           |       |
| 400.0                                  | 59.0           |       | 58.4           |       | 56.7           |       | 56.8           |       | 55.9           |       | 57.1           |       |
| 500.0                                  | 59.8           |       | 58.5           |       | 58.5           |       | 57.6           |       | 56.9           |       | 56.6           |       |
| 630.0                                  | 61.7           |       | 60.5           |       | 59.8           |       | 58.9           |       | 58.6           |       | 58.1           |       |
| 800.0                                  | 63.2           |       | 61.8           |       | 60.7           |       | 60.0           |       | 59.7           |       | 59.0           |       |
| 1000.0                                 | 63.6           |       | 62.1           |       | 61.4           |       | 60.5           |       | 60.1           |       | 59.2           |       |
| 1250.0                                 | 64.1           |       | 62.9           |       | 62.7           |       | 61.8           |       | 61.3           |       | 60.6           |       |
| 1600.0                                 | 64.2           |       | 63.1           |       | 62.4           |       | 61.7           |       | 61.2           |       | 60.5           |       |
| 2000.0                                 | 64.1           |       | 63.5           |       | 62.9           |       | 62.5           |       | 61.5           |       | 60.8           |       |
| 2500.0                                 | 64.3           |       | 63.3           |       | 62.7           |       | 62.2           |       | 61.7           |       | 60.8           |       |
| 3150.0                                 | 63.9           |       | 63.1           |       | 62.6           |       | 62.2           |       | 61.8           |       | 61.0           |       |
| 4000.0                                 | 63.5           |       | 63.1           |       | 62.7           |       | 62.0           |       | 61.5           |       | 60.5           |       |
| 5000.0                                 | 62.7           |       | 62.8           |       | 62.4           |       | 61.6           |       | 61.4           |       | 60.2           |       |
| 6300.0                                 | 61.9           |       | 62.9           |       | 61.8           |       | 61.5           |       | 61.0           |       | 60.1           |       |
| 8000.0                                 | 61.8           |       | 62.5           |       | 60.4           |       | 60.6           |       | 60.1           |       | 59.3           |       |
| 10000.0                                | 61.6           |       | 62.3           |       | 60.1           |       | 60.2           |       | 59.7           |       | 59.0           |       |
| 12500.0                                | 61.7           |       | 60.3           |       | 60.1           |       | 59.6           |       | 59.1           |       | 58.4           |       |
| 16000.0                                | 60.2           |       | 60.2           |       | 58.8           |       | 59.1           |       | 58.6           |       | 57.9           |       |
| 20000.0                                | 58.6           |       | 60.2           |       | 58.7           |       | 58.4           |       | 57.6           |       | 57.3           |       |
| 25000.0                                | 59.5           |       | 58.8           |       | 58.3           |       | 58.0           |       | 57.2           |       | 57.1           |       |
| 31500.0                                | 59.5           |       | 59.1           |       | 58.3           |       | 57.8           |       | 57.1           |       | 57.1           |       |
| 40000.0                                | 58.8           |       | 59.4           |       | 58.3           |       | 58.4           |       | 56.9           |       | 58.1           |       |
| OVERALL<br>SPL                         | 75.5           |       | 75.1           |       | 74.3           |       | 73.8           |       | 73.2           |       | 72.6           |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 53.5                        | 56.3                        | 53.3                        | 53.8                        |
| 250.0                                  | 53.8                        | 51.8                        | 52.0                        | 52.8                        |
| 315.2                                  | 54.7                        | 54.2                        | 52.9                        | 53.6                        |
| 400.0                                  | 55.8                        | 56.3                        | 56.0                        | 58.9                        |
| 500.0                                  | 56.7                        | 55.2                        | 55.2                        | 55.0                        |
| 630.0                                  | 57.8                        | 56.6                        | 56.2                        | 55.0                        |
| 800.0                                  | 58.7                        | 57.4                        | 57.3                        | 55.6                        |
| 1000.0                                 | 59.3                        | 57.8                        | 57.0                        | 55.9                        |
| 1250.0                                 | 60.1                        | 58.8                        | 57.7                        | 55.9                        |
| 1600.0                                 | 59.9                        | 58.4                        | 57.2                        | 55.7                        |
| 2000.0                                 | 60.6                        | 59.1                        | 57.8                        | 55.4                        |
| 2500.0                                 | 60.7                        | 59.2                        | 57.5                        | 55.2                        |
| 3150.0                                 | 60.8                        | 59.2                        | 57.4                        | 55.0                        |
| 4000.0                                 | 60.6                        | 58.9                        | 57.3                        | 54.2                        |
| 5000.0                                 | 60.4                        | 58.3                        | 56.7                        | 53.5                        |
| 6300.0                                 | 60.5                        | 58.3                        | 55.9                        | 53.9                        |
| 8000.0                                 | 59.7                        | 57.7                        | 55.4                        | 52.5                        |
| 10000.0                                | 58.7                        | 56.7                        | 54.5                        | 51.5                        |
| 12500.0                                | 58.5                        | 56.3                        | 53.9                        | 50.9                        |
| 16000.0                                | 58.3                        | 55.8                        | 53.7                        | 50.2                        |
| 20000.0                                | 57.6                        | 55.0                        | 52.9                        | 49.3                        |
| 25000.0                                | 56.9                        | 54.2                        | 52.4                        | 48.0                        |
| 31500.0                                | 56.7                        | 54.0                        | 52.0                        | 47.2                        |
| 40000.0                                | 56.7                        | 54.1                        | 51.5                        | 47.2                        |
| OVERALL<br>SPL                         | 72.5                        | 70.9                        | 69.4                        | 67.9                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.80 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 326.00 DEG.F, CHAMBER TEMPERATURE = 78.00 DEG.F  
RELATIVE HUMIDITY = 47.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 35

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.127$   
TEMPERATURE RATIO  $TR = 1.461$   
MACH NUMBER  $MJ = 0.418$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.413$   
JET DENSITY RATIO  $DJ/DO = 0.708$   
JET VELOCITY RATIO  $VJ/AO = 0.497$   
JET VELOCITY  $VJ = 564.8$  FPS

$TR/TJ = 1.034$   
 $DR/DO = 0.771$   
 $DR/DJ = 1.090$   
MASS FLOW = 0.644 POUNDS PER SECOND  
THRUST = 11.26 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

## 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |           | MICRO     |           | MICRO     |           | MICRO     |           | MICRO     |           | MICRO     |           |
|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| OCTAVE  | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     | MICRO     |
| CENTER  | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     | PHONE     |
| FREQ.   | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE |
| HZ      | 1 15.0    | 2 22.5    | 3 30.0    | 4 37.5    | 5 45.0    | 6 52.5    |           |           |           |           |           |
| 200.0   | 66.8      | 67.1      | 61.7      | 60.2      | 58.9      | 57.2      |           |           |           |           |           |
| 250.0   | 68.4      | 69.0      | 65.4      | 63.4      | 61.9      | 60.1      |           |           |           |           |           |
| 315.2   | 71.8      | 70.7      | 69.0      | 66.2      | 64.7      | 62.8      |           |           |           |           |           |
| 400.0   | 73.6      | 73.9      | 70.0      | 68.4      | 66.7      | 65.0      |           |           |           |           |           |
| 500.0   | 75.8      | 73.9      | 72.8      | 69.9      | 68.8      | 66.7      |           |           |           |           |           |
| 630.0   | 74.9      | 75.0      | 73.9      | 71.0      | 70.0      | 68.7      |           |           |           |           |           |
| 800.0   | 76.8      | 76.4      | 75.1      | 72.5      | 72.0      | 70.1      |           |           |           |           |           |
| 1000.0  | 75.2      | 75.9      | 75.4      | 73.3      | 72.5      | 71.3      |           |           |           |           |           |
| 1250.0  | 74.5      | 76.1      | 76.3      | 74.2      | 73.8      | 72.1      |           |           |           |           |           |
| 1600.0  | 72.3      | 74.6      | 74.8      | 73.7      | 73.4      | 72.7      |           |           |           |           |           |
| 2000.0  | 69.9      | 73.5      | 74.3      | 73.6      | 74.0      | 72.8      |           |           |           |           |           |
| 2500.0  | 68.0      | 71.6      | 73.2      | 72.8      | 73.4      | 72.7      |           |           |           |           |           |
| 3150.0  | 65.7      | 69.7      | 71.8      | 72.0      | 72.7      | 72.4      |           |           |           |           |           |
| 4000.0  | 65.6      | 68.7      | 70.4      | 70.9      | 72.6      | 71.9      |           |           |           |           |           |
| 5000.0  | 63.9      | 67.3      | 68.9      | 69.6      | 71.7      | 71.6      |           |           |           |           |           |
| 6300.0  | 63.8      | 65.6      | 67.2      | 68.3      | 70.6      | 70.8      |           |           |           |           |           |
| 8000.0  | 63.5      | 64.0      | 65.8      | 66.9      | 69.6      | 69.8      |           |           |           |           |           |
| 10000.0 | 64.3      | 62.8      | 64.5      | 65.0      | 68.6      | 69.0      |           |           |           |           |           |
| 12500.0 | 63.5      | 61.5      | 63.1      | 64.4      | 67.6      | 68.3      |           |           |           |           |           |
| 16000.0 | 61.2      | 61.0      | 61.7      | 63.0      | 66.5      | 67.4      |           |           |           |           |           |
| 20000.0 | 58.2      | 59.8      | 60.3      | 61.6      | 65.0      | 66.5      |           |           |           |           |           |
| 25000.0 | 57.2      | 61.0      | 59.7      | 60.5      | 64.2      | 66.2      |           |           |           |           |           |
| 31500.0 | 58.2      | 63.0      | 58.8      | 59.0      | 63.1      | 65.4      |           |           |           |           |           |
| 40000.0 | 60.1      | 66.2      | 58.3      | 58.6      | 62.6      | 64.8      |           |           |           |           |           |
| OVERALL |           |           |           |           |           |           |           |           |           |           |           |
| SPL     | 84.5      | 85.3      | 84.9      | 83.6      | 84.0      | 83.4      |           |           |           |           |           |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 55.6                                  | 56.5                                  | 54.6                                  | 54.4                                   | 55.0                                   | 55.0                                   |
| 250.0                                  | 57.7                                  | 57.0                                  | 56.0                                  | 55.4                                   | 55.9                                   | 54.9                                   |
| 315.2                                  | 61.0                                  | 59.5                                  | 59.0                                  | 57.4                                   | 58.1                                   | 57.7                                   |
| 400.0                                  | 63.4                                  | 61.9                                  | 60.9                                  | 59.9                                   | 59.0                                   | 58.9                                   |
| 500.0                                  | 65.0                                  | 63.2                                  | 63.1                                  | 61.8                                   | 61.6                                   | 60.4                                   |
| 630.0                                  | 66.8                                  | 65.4                                  | 64.3                                  | 63.9                                   | 63.2                                   | 62.1                                   |
| 800.0                                  | 68.1                                  | 67.2                                  | 65.9                                  | 64.7                                   | 64.2                                   | 63.7                                   |
| 1000.0                                 | 69.3                                  | 68.1                                  | 67.0                                  | 66.0                                   | 65.9                                   | 64.9                                   |
| 1250.0                                 | 70.5                                  | 69.3                                  | 68.4                                  | 67.5                                   | 67.3                                   | 66.2                                   |
| 1600.0                                 | 71.0                                  | 69.9                                  | 68.9                                  | 68.0                                   | 67.5                                   | 66.8                                   |
| 2000.0                                 | 71.6                                  | 70.4                                  | 69.4                                  | 68.6                                   | 68.0                                   | 67.4                                   |
| 2500.0                                 | 71.6                                  | 70.7                                  | 69.6                                  | 68.8                                   | 68.2                                   | 67.6                                   |
| 3150.0                                 | 71.5                                  | 70.5                                  | 69.8                                  | 69.2                                   | 68.7                                   | 67.9                                   |
| 4000.0                                 | 71.4                                  | 70.6                                  | 69.8                                  | 69.1                                   | 68.6                                   | 68.0                                   |
| 5000.0                                 | 71.3                                  | 70.5                                  | 69.3                                  | 69.0                                   | 68.8                                   | 68.2                                   |
| 6300.0                                 | 70.5                                  | 69.9                                  | 68.7                                  | 68.6                                   | 68.4                                   | 68.0                                   |
| 8000.0                                 | 70.0                                  | 69.4                                  | 68.3                                  | 67.9                                   | 67.8                                   | 67.7                                   |
| 10000.0                                | 68.8                                  | 68.8                                  | 67.5                                  | 67.7                                   | 67.2                                   | 67.3                                   |
| 12500.0                                | 68.6                                  | 68.2                                  | 67.1                                  | 66.7                                   | 66.7                                   | 66.8                                   |
| 16000.0                                | 67.8                                  | 67.6                                  | 66.7                                  | 65.8                                   | 66.1                                   | 66.1                                   |
| 20000.0                                | 67.1                                  | 66.6                                  | 65.9                                  | 64.7                                   | 65.0                                   | 64.8                                   |
| 25000.0                                | 66.6                                  | 65.9                                  | 65.7                                  | 64.1                                   | 64.4                                   | 64.0                                   |
| 31500.0                                | 65.8                                  | 64.9                                  | 64.8                                  | 62.8                                   | 63.3                                   | 62.8                                   |
| 40000.0                                | 65.6                                  | 64.5                                  | 64.1                                  | 61.8                                   | 63.1                                   | 61.9                                   |
| OVERALL<br>SPL                         | 82.6                                  | 81.7                                  | 80.8                                  | 80.0                                   | 79.8                                   | 79.3                                   |

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.80 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 307.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 211

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.127$   
TEMPERATURE RATIO  $TR = 1.481$   
MACH NUMBER  $MJ = 0.418$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.432$   
JET DENSITY RATIO  $DJ/D_0 = 0.698$   
JET VELOCITY RATIO  $VJ/A_0 = 0.500$   
JET VELOCITY  $VJ = 558.3$  FPS

$TR/TJ = 1.034$   
 $DR/D_0 = 0.761$   
 $DR/DJ = 1.090$   
MASS FLOW = 0.640 POUNDS PER SECOND  
THRUST = 11.27 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 55.6                                  | 56.5                                  | 54.6                                  | 54.4                                   | 55.0                                   | 55.0                                   |
| 250.0                                  | 57.7                                  | 57.0                                  | 56.0                                  | 55.4                                   | 55.9                                   | 54.9                                   |
| 315.2                                  | 61.0                                  | 59.5                                  | 59.0                                  | 57.4                                   | 58.1                                   | 57.7                                   |
| 400.0                                  | 63.4                                  | 61.9                                  | 60.9                                  | 59.9                                   | 59.0                                   | 58.9                                   |
| 500.0                                  | 65.0                                  | 63.2                                  | 63.1                                  | 61.8                                   | 61.6                                   | 60.4                                   |
| 630.0                                  | 66.8                                  | 65.4                                  | 64.3                                  | 63.9                                   | 63.2                                   | 62.1                                   |
| 800.0                                  | 68.1                                  | 67.2                                  | 65.9                                  | 64.7                                   | 64.2                                   | 63.7                                   |
| 1000.0                                 | 69.3                                  | 68.1                                  | 67.0                                  | 66.0                                   | 65.9                                   | 64.9                                   |
| 1250.0                                 | 70.5                                  | 69.3                                  | 68.4                                  | 67.5                                   | 67.3                                   | 66.2                                   |
| 1600.0                                 | 71.0                                  | 69.9                                  | 68.9                                  | 68.0                                   | 67.5                                   | 66.8                                   |
| 2000.0                                 | 71.6                                  | 70.4                                  | 69.4                                  | 68.6                                   | 68.0                                   | 67.4                                   |
| 2500.0                                 | 71.6                                  | 70.7                                  | 69.6                                  | 68.8                                   | 68.2                                   | 67.6                                   |
| 3150.0                                 | 71.5                                  | 70.5                                  | 69.8                                  | 69.2                                   | 68.7                                   | 67.9                                   |
| 4000.0                                 | 71.4                                  | 70.6                                  | 69.8                                  | 69.1                                   | 68.6                                   | 68.0                                   |
| 5000.0                                 | 71.3                                  | 70.5                                  | 69.3                                  | 69.0                                   | 68.8                                   | 68.2                                   |
| 6300.0                                 | 70.5                                  | 69.9                                  | 68.7                                  | 68.6                                   | 68.4                                   | 68.0                                   |
| 8000.0                                 | 70.0                                  | 69.4                                  | 68.3                                  | 67.9                                   | 67.8                                   | 67.7                                   |
| 10000.0                                | 68.8                                  | 68.8                                  | 67.5                                  | 67.7                                   | 67.2                                   | 67.3                                   |
| 12500.0                                | 68.6                                  | 68.2                                  | 67.1                                  | 66.7                                   | 66.7                                   | 66.8                                   |
| 16000.0                                | 67.8                                  | 67.6                                  | 66.7                                  | 65.8                                   | 66.1                                   | 66.1                                   |
| 20000.0                                | 67.1                                  | 66.6                                  | 65.9                                  | 64.7                                   | 65.0                                   | 64.8                                   |
| 25000.0                                | 66.6                                  | 65.9                                  | 65.7                                  | 64.1                                   | 64.4                                   | 64.0                                   |
| 31500.0                                | 65.8                                  | 64.9                                  | 64.8                                  | 62.8                                   | 63.3                                   | 62.8                                   |
| 40000.0                                | 65.6                                  | 64.5                                  | 64.1                                  | 61.8                                   | 63.1                                   | 61.9                                   |
| OVERALL<br>SPL                         | 82.6                                  | 81.7                                  | 80.8                                  | 80.0                                   | 79.8                                   | 79.3                                   |

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 54.4                        | 55.5                        | 56.4                        | 55.7                        | 54.8                        | 54.8                        |
| 250.0                                  | 56.7                        | 57.2                        | 57.0                        | 56.1                        | 56.1                        | 55.3                        |
| 315.2                                  | 59.7                        | 59.6                        | 59.0                        | 59.0                        | 58.7                        | 57.5                        |
| 400.0                                  | 61.7                        | 61.2                        | 60.2                        | 60.2                        | 60.0                        | 59.8                        |
| 500.0                                  | 63.9                        | 63.7                        | 62.5                        | 62.1                        | 61.6                        | 60.4                        |
| 630.0                                  | 66.1                        | 65.7                        | 64.1                        | 63.4                        | 62.6                        | 62.6                        |
| 800.0                                  | 68.0                        | 67.0                        | 65.4                        | 64.9                        | 64.1                        | 63.5                        |
| 1000.0                                 | 68.9                        | 67.2                        | 66.2                        | 65.7                        | 64.9                        | 64.3                        |
| 1250.0                                 | 70.0                        | 68.4                        | 67.9                        | 67.4                        | 66.8                        | 65.4                        |
| 1600.0                                 | 69.9                        | 69.2                        | 67.8                        | 67.8                        | 67.0                        | 66.0                        |
| 2000.0                                 | 70.3                        | 69.9                        | 68.6                        | 68.5                        | 67.4                        | 66.9                        |
| 2500.0                                 | 70.5                        | 69.8                        | 68.7                        | 68.6                        | 67.9                        | 67.1                        |
| 3150.0                                 | 70.6                        | 69.9                        | 68.7                        | 68.8                        | 68.1                        | 67.3                        |
| 4000.0                                 | 70.5                        | 70.0                        | 68.9                        | 68.8                        | 68.1                        | 67.1                        |
| 5000.0                                 | 70.0                        | 69.9                        | 68.8                        | 68.6                        | 68.0                        | 66.9                        |
| 6300.0                                 | 69.8                        | 70.1                        | 68.6                        | 68.3                        | 68.0                        | 67.2                        |
| 8000.0                                 | 69.6                        | 70.0                        | 67.0                        | 67.8                        | 67.2                        | 66.3                        |
| 10000.0                                | 69.7                        | 69.3                        | 66.9                        | 67.2                        | 66.6                        | 65.8                        |
| 12500.0                                | 69.5                        | 67.6                        | 66.6                        | 66.8                        | 66.2                        | 65.3                        |
| 16000.0                                | 67.9                        | 67.5                        | 65.3                        | 66.3                        | 65.6                        | 64.8                        |
| 20000.0                                | 66.5                        | 67.3                        | 65.1                        | 65.7                        | 64.8                        | 64.4                        |
| 25000.0                                | 67.4                        | 66.0                        | 64.8                        | 65.3                        | 64.4                        | 64.4                        |
| 31500.0                                | 67.3                        | 66.3                        | 64.6                        | 65.1                        | 64.4                        | 64.6                        |
| 40000.0                                | 67.5                        | 66.5                        | 64.6                        | 65.7                        | 64.4                        | 65.3                        |
| OVERALL<br>SPL                         | 82.1                        | 81.5                        | 80.1                        | 80.1                        | 79.4                        | 78.7                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE | PHONE | PHONE | PHONE |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 55.2  | 57.4  | 54.9  | 55.2  |
| 250.0   | 56.4  | 55.0  | 54.5  | 54.8  |
| 315.2   | 58.1  | 56.7  | 54.5  | 55.8  |
| 400.0   | 59.4  | 58.3  | 57.6  | 58.4  |
| 500.0   | 60.7  | 59.0  | 58.9  | 58.6  |
| 630.0   | 62.5  | 61.0  | 59.4  | 59.0  |
| 800.0   | 63.3  | 61.8  | 61.2  | 59.9  |
| 1000.0  | 64.1  | 62.7  | 62.0  | 60.8  |
| 1250.0  | 65.0  | 63.8  | 62.2  | 60.7  |
| 1600.0  | 65.6  | 64.0  | 63.0  | 61.0  |
| 2000.0  | 66.2  | 65.2  | 63.2  | 61.4  |
| 2500.0  | 66.6  | 65.2  | 63.9  | 61.3  |
| 3150.0  | 67.0  | 65.6  | 63.9  | 61.2  |
| 4000.0  | 67.2  | 65.5  | 63.9  | 60.8  |
| 5000.0  | 67.0  | 65.0  | 63.5  | 60.3  |
| 6300.0  | 67.0  | 65.0  | 63.2  | 60.4  |
| 8000.0  | 66.5  | 64.6  | 62.6  | 59.6  |
| 10000.0 | 65.9  | 63.7  | 61.8  | 58.6  |
| 12500.0 | 65.5  | 63.4  | 61.1  | 58.2  |
| 16000.0 | 65.0  | 62.9  | 60.5  | 57.2  |
| 20000.0 | 64.5  | 62.1  | 59.7  | 56.3  |
| 25000.0 | 64.1  | 61.6  | 59.5  | 55.3  |
| 31500.0 | 64.0  | 61.4  | 59.2  | 54.6  |
| 40000.0 | 64.3  | 61.6  | 59.6  | 54.0  |
| OVERALL |       |       |       |       |
| SPL     | 78.5  | 76.8  | 75.2  | 72.9  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.64 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 337.00 DEG.F, CHAMBER TEMPERATURE = 78.00 DEG.F  
RELATIVE HUMIDITY = 47.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 36

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.186  
TEMPERATURE RATIO TR = 1.481  
MACH NUMBER MJ = 0.501  
JET STATIC TEMPERATURE RATIO TJ/TO = 1.412  
JET DENSITY RATIO DJ/DO = 0.708  
JET VELOCITY RATIO VJ/A0 = 0.596  
JET VELOCITY VJ = 677.3 FPS

TR/TJ = 1.049  
DR/DO = 0.801  
DR/DJ = 1.131  
MASS FLOW = 0.772 POUNDS PER SECOND  
THRUST = 16.20 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 71.0                                  | 70.3                                  | 66.2                                  | 63.9                                  | 63.1                                  | 60.4                                  |
| 250.0                                  | 72.9                                  | 72.8                                  | 70.9                                  | 67.6                                  | 65.2                                  | 63.8                                  |
| 315.2                                  | 77.4                                  | 74.7                                  | 74.2                                  | 70.1                                  | 68.6                                  | 66.0                                  |
| 400.0                                  | 78.8                                  | 78.9                                  | 75.0                                  | 72.9                                  | 71.3                                  | 68.8                                  |
| 500.0                                  | 81.5                                  | 79.2                                  | 78.2                                  | 74.9                                  | 74.0                                  | 70.9                                  |
| 630.0                                  | 80.5                                  | 81.0                                  | 80.1                                  | 76.9                                  | 75.5                                  | 72.7                                  |
| 800.0                                  | 83.0                                  | 82.8                                  | 80.6                                  | 78.2                                  | 76.9                                  | 74.7                                  |
| 1000.0                                 | 81.6                                  | 82.2                                  | 81.4                                  | 79.0                                  | 78.1                                  | 76.1                                  |
| 1250.0                                 | 80.3                                  | 82.1                                  | 81.8                                  | 80.1                                  | 79.4                                  | 77.2                                  |
| 1600.0                                 | 77.6                                  | 80.7                                  | 80.9                                  | 79.6                                  | 79.4                                  | 77.7                                  |
| 2000.0                                 | 75.8                                  | 79.4                                  | 80.3                                  | 79.5                                  | 79.9                                  | 78.4                                  |
| 2500.0                                 | 73.7                                  | 77.4                                  | 79.1                                  | 78.8                                  | 79.6                                  | 78.3                                  |
| 3150.0                                 | 71.7                                  | 75.7                                  | 77.7                                  | 78.0                                  | 79.4                                  | 78.4                                  |
| 4000.0                                 | 71.3                                  | 74.4                                  | 76.3                                  | 77.1                                  | 79.2                                  | 78.1                                  |
| 5000.0                                 | 69.7                                  | 73.1                                  | 74.9                                  | 75.7                                  | 78.3                                  | 77.6                                  |
| 6300.0                                 | 69.4                                  | 71.8                                  | 73.2                                  | 74.6                                  | 77.4                                  | 77.2                                  |
| 8000.0                                 | 69.0                                  | 70.3                                  | 71.8                                  | 73.2                                  | 76.4                                  | 76.3                                  |
| 10000.0                                | 68.4                                  | 68.5                                  | 70.4                                  | 72.0                                  | 75.4                                  | 75.4                                  |
| 12500.0                                | 68.8                                  | 67.8                                  | 68.9                                  | 70.6                                  | 74.5                                  | 74.3                                  |
| 16000.0                                | 66.3                                  | 66.6                                  | 67.4                                  | 69.3                                  | 73.3                                  | 73.9                                  |
| 20000.0                                | 63.2                                  | 64.6                                  | 65.7                                  | 67.6                                  | 71.9                                  | 72.8                                  |
| 25000.0                                | 61.8                                  | 64.5                                  | 64.8                                  | 66.4                                  | 71.1                                  | 72.2                                  |
| 31500.0                                | 61.3                                  | 65.0                                  | 63.3                                  | 64.4                                  | 69.9                                  | 71.3                                  |
| 40000.0                                | 61.5                                  | 67.0                                  | 62.5                                  | 63.4                                  | 69.1                                  | 70.8                                  |
| OVERALL<br>SPL                         | 90.3                                  | 91.0                                  | 90.7                                  | 89.4                                  | 90.1                                  | 89.0                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 59.9                                  | 58.7                                  | 57.5                                  | 58.1                                   | 58.1                                   | 58.4                                   |
| 250.0                                  | 61.7                                  | 60.0                                  | 59.8                                  | 59.3                                   | 59.0                                   | 58.4                                   |
| 315.2                                  | 63.5                                  | 62.4                                  | 62.5                                  | 62.1                                   | 61.3                                   | 61.2                                   |
| 400.0                                  | 66.3                                  | 65.3                                  | 64.3                                  | 63.8                                   | 62.9                                   | 61.8                                   |
| 500.0                                  | 69.0                                  | 67.2                                  | 66.3                                  | 64.7                                   | 64.6                                   | 63.3                                   |
| 630.0                                  | 70.4                                  | 69.0                                  | 68.4                                  | 67.4                                   | 66.5                                   | 66.2                                   |
| 800.0                                  | 72.3                                  | 70.9                                  | 69.9                                  | 69.0                                   | 68.3                                   | 67.3                                   |
| 1000.0                                 | 73.8                                  | 72.6                                  | 71.3                                  | 70.3                                   | 69.7                                   | 68.9                                   |
| 1250.0                                 | 75.4                                  | 74.0                                  | 72.8                                  | 72.0                                   | 71.5                                   | 70.6                                   |
| 1600.0                                 | 76.0                                  | 74.4                                  | 73.3                                  | 72.4                                   | 71.9                                   | 71.0                                   |
| 2000.0                                 | 76.6                                  | 75.3                                  | 74.1                                  | 73.3                                   | 72.8                                   | 72.1                                   |
| 2500.0                                 | 76.8                                  | 75.6                                  | 74.6                                  | 73.8                                   | 73.4                                   | 72.5                                   |
| 3150.0                                 | 77.0                                  | 75.9                                  | 74.8                                  | 74.3                                   | 73.9                                   | 73.1                                   |
| 4000.0                                 | 76.9                                  | 76.3                                  | 75.3                                  | 74.4                                   | 74.1                                   | 73.2                                   |
| 5000.0                                 | 76.7                                  | 76.2                                  | 75.1                                  | 74.6                                   | 74.5                                   | 73.6                                   |
| 6300.0                                 | 76.5                                  | 75.9                                  | 74.5                                  | 74.3                                   | 74.3                                   | 73.6                                   |
| 8000.0                                 | 76.3                                  | 75.4                                  | 74.4                                  | 73.9                                   | 74.0                                   | 73.5                                   |
| 10000.0                                | 75.8                                  | 74.8                                  | 73.8                                  | 73.5                                   | 73.6                                   | 73.2                                   |
| 12500.0                                | 75.2                                  | 74.0                                  | 73.4                                  | 72.9                                   | 72.9                                   | 72.7                                   |
| 16000.0                                | 74.4                                  | 73.5                                  | 73.1                                  | 72.0                                   | 72.5                                   | 72.1                                   |
| 20000.0                                | 73.8                                  | 72.4                                  | 72.4                                  | 71.1                                   | 71.3                                   | 70.8                                   |
| 25000.0                                | 73.2                                  | 71.7                                  | 72.0                                  | 70.5                                   | 70.8                                   | 69.9                                   |
| 31500.0                                | 72.2                                  | 70.5                                  | 71.3                                  | 69.2                                   | 69.7                                   | 68.4                                   |
| 40000.0                                | 71.7                                  | 69.9                                  | 70.4                                  | 68.1                                   | 69.3                                   | 67.3                                   |
| OVERALL<br>SPL                         | 88.1                                  | 87.0                                  | 86.1                                  | 85.3                                   | 85.2                                   | 84.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.64 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 315.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 212

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.186$   
TEMPERATURE RATIO  $TR = 1.496$   
MACH NUMBER  $MJ = 0.502$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.426$   
JET DENSITY RATIO  $DJ/DO = 0.701$   
JET VELOCITY RATIO  $VJ/AO = 0.599$   
JET VELOCITY  $VJ = 668.3$  FPS

$TR/TJ = 1.049$   
 $DR/DO = 0.793$   
 $DR/DJ = 1.131$   
MASS FLOW = 0.769 POUNDS PER SECOND  
THRUST = 16.22 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 56.4                                   | 58.5                                   | 58.4                                   | 58.0                                    | 56.5                                    | 56.0                                    |
| 250.0                                  | 59.5                                   | 60.1                                   | 59.0                                   | 58.5                                    | 58.4                                    | 58.1                                    |
| 315.2                                  | 61.7                                   | 62.7                                   | 62.1                                   | 61.4                                    | 61.0                                    | 60.1                                    |
| 400.0                                  | 63.9                                   | 64.1                                   | 63.1                                   | 62.7                                    | 62.2                                    | 61.9                                    |
| 500.0                                  | 66.6                                   | 66.3                                   | 65.7                                   | 65.4                                    | 64.0                                    | 63.4                                    |
| 630.0                                  | 68.9                                   | 68.4                                   | 67.4                                   | 66.8                                    | 65.7                                    | 65.9                                    |
| 800.0                                  | 71.0                                   | 70.4                                   | 68.9                                   | 67.9                                    | 67.2                                    | 66.5                                    |
| 1000.0                                 | 72.7                                   | 71.3                                   | 70.0                                   | 69.6                                    | 68.3                                    | 67.8                                    |
| 1250.0                                 | 73.6                                   | 72.4                                   | 71.5                                   | 71.0                                    | 70.1                                    | 69.6                                    |
| 1600.0                                 | 74.0                                   | 73.1                                   | 72.0                                   | 71.6                                    | 70.6                                    | 70.0                                    |
| 2000.0                                 | 74.3                                   | 73.9                                   | 72.7                                   | 72.3                                    | 71.2                                    | 70.8                                    |
| 2500.0                                 | 74.6                                   | 74.2                                   | 72.9                                   | 72.6                                    | 72.0                                    | 71.2                                    |
| 3150.0                                 | 75.1                                   | 74.6                                   | 73.4                                   | 73.4                                    | 72.2                                    | 71.8                                    |
| 4000.0                                 | 75.3                                   | 74.8                                   | 73.7                                   | 73.5                                    | 72.5                                    | 71.9                                    |
| 5000.0                                 | 74.8                                   | 74.9                                   | 74.1                                   | 73.5                                    | 72.7                                    | 71.9                                    |
| 6300.0                                 | 74.7                                   | 75.3                                   | 73.9                                   | 73.4                                    | 72.4                                    | 72.2                                    |
| 8000.0                                 | 74.6                                   | 75.5                                   | 72.7                                   | 72.8                                    | 72.1                                    | 71.6                                    |
| 10000.0                                | 75.0                                   | 74.9                                   | 72.7                                   | 72.2                                    | 71.6                                    | 71.0                                    |
| 12500.0                                | 74.8                                   | 73.4                                   | 72.5                                   | 71.9                                    | 71.4                                    | 70.8                                    |
| 16000.0                                | 73.2                                   | 73.2                                   | 71.1                                   | 71.2                                    | 70.7                                    | 70.4                                    |
| 20000.0                                | 71.6                                   | 73.0                                   | 70.9                                   | 70.8                                    | 70.0                                    | 69.7                                    |
| 25000.0                                | 72.4                                   | 71.7                                   | 70.6                                   | 70.2                                    | 69.6                                    | 69.6                                    |
| 31500.0                                | 72.2                                   | 72.0                                   | 70.5                                   | 70.0                                    | 69.3                                    | 69.8                                    |
| 40000.0                                | 71.7                                   | 72.2                                   | 70.6                                   | 70.3                                    | 68.8                                    | 70.3                                    |
| OVERALL<br>SPL                         | 86.6                                   | 86.3                                   | 84.9                                   | 84.6                                    | 83.7                                    | 83.3                                    |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>16 | ANGLE<br>127.5 | MICRO<br>PHONE<br>NO.<br>17 | ANGLE<br>135.0 | MICRO<br>PHONE<br>NO.<br>18 | ANGLE<br>142.5 | MICRO<br>PHONE<br>NO.<br>19 | ANGLE<br>150.0 |
|--|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 56.8                        |                | 58.4                        |                | 56.9                        |                | 56.9                        |                |
| 250.0                                  | 58.7                        |                | 58.0                        |                | 57.6                        |                | 58.3                        |                |
| 315.2                                  | 59.7                        |                | 59.0                        |                | 58.3                        |                | 59.0                        |                |
| 400.0                                  | 61.5                        |                | 60.8                        |                | 60.8                        |                | 61.2                        |                |
| 500.0                                  | 63.0                        |                | 62.1                        |                | 61.7                        |                | 60.9                        |                |
| 630.0                                  | 65.3                        |                | 64.8                        |                | 62.9                        |                | 62.1                        |                |
| 800.0                                  | 65.9                        |                | 65.2                        |                | 64.5                        |                | 63.4                        |                |
| 1000.0                                 | 66.9                        |                | 66.0                        |                | 65.0                        |                | 64.1                        |                |
| 1250.0                                 | 68.4                        |                | 67.7                        |                | 65.9                        |                | 64.6                        |                |
| 1600.0                                 | 69.2                        |                | 67.7                        |                | 66.6                        |                | 65.0                        |                |
| 2000.0                                 | 70.1                        |                | 69.2                        |                | 67.6                        |                | 65.5                        |                |
| 2500.0                                 | 70.6                        |                | 69.4                        |                | 67.7                        |                | 65.9                        |                |
| 3150.0                                 | 71.2                        |                | 70.1                        |                | 68.3                        |                | 66.1                        |                |
| 4000.0                                 | 71.6                        |                | 70.4                        |                | 68.7                        |                | 66.1                        |                |
| 5000.0                                 | 71.8                        |                | 69.9                        |                | 68.2                        |                | 65.6                        |                |
| 6300.0                                 | 71.8                        |                | 70.1                        |                | 68.1                        |                | 65.7                        |                |
| 8000.0                                 | 71.4                        |                | 70.0                        |                | 67.4                        |                | 65.0                        |                |
| 10000.0                                | 71.0                        |                | 69.0                        |                | 66.7                        |                | 64.0                        |                |
| 12500.0                                | 70.6                        |                | 68.7                        |                | 66.1                        |                | 63.3                        |                |
| 16000.0                                | 70.2                        |                | 68.3                        |                | 65.6                        |                | 62.4                        |                |
| 20000.0                                | 69.6                        |                | 67.4                        |                | 64.7                        |                | 61.5                        |                |
| 25000.0                                | 69.1                        |                | 66.9                        |                | 64.2                        |                | 60.6                        |                |
| 31500.0                                | 68.7                        |                | 66.7                        |                | 63.9                        |                | 59.9                        |                |
| 40000.0                                | 68.8                        |                | 67.2                        |                | 63.7                        |                | 59.3                        |                |
| OVERALL<br>SPL                         | 82.9                        |                | 81.4                        |                | 79.4                        |                | 77.3                        |                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 3.69 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 351.00 DEG.F, CHAMBER TEMPERATURE = 79.00 DEG.F  
RELATIVE HUMIDITY = 46.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 37

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.260$   
TEMPERATURE RATIO  $TR = 1.505$   
MACH NUMBER  $MJ = 0.586$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.410$   
JET DENSITY RATIO  $DJ/DO = 0.709$   
JET VELOCITY RATIO  $VJ/A0 = 0.696$   
JET VELOCITY  $VJ = 791.9$  FPS

$TR/TJ = 1.067$   
 $DR/DO = 0.837$   
 $OR/DJ = 1.181$   
MASS FLOW = 0.903 POUNDS PER SECOND  
THRUST = 22.13 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 74.9  |       | 75.8  |       | 71.3  |       |
| 250.0   | 77.2  |       | 77.1  |       | 75.2  |       |
| 315.2   | 81.3  |       | 80.3  |       | 79.0  |       |
| 400.0   | 83.5  |       | 84.2  |       | 80.8  |       |
| 500.0   | 86.5  |       | 84.3  |       | 83.8  |       |
| 630.0   | 86.0  |       | 86.3  |       | 85.8  |       |
| 800.0   | 88.8  |       | 88.5  |       | 87.2  |       |
| 1000.0  | 87.5  |       | 88.5  |       | 88.1  |       |
| 1250.0  | 86.4  |       | 88.4  |       | 88.7  |       |
| 1600.0  | 83.5  |       | 86.3  |       | 87.5  |       |
| 2000.0  | 81.2  |       | 84.8  |       | 86.8  |       |
| 2500.0  | 79.2  |       | 83.0  |       | 85.4  |       |
| 3150.0  | 77.0  |       | 81.6  |       | 84.0  |       |
| 4000.0  | 76.5  |       | 80.3  |       | 83.1  |       |
| 5000.0  | 75.0  |       | 79.0  |       | 81.7  |       |
| 6300.0  | 74.4  |       | 77.6  |       | 80.3  |       |
| 8000.0  | 74.2  |       | 76.2  |       | 79.1  |       |
| 10000.0 | 73.9  |       | 74.7  |       | 78.1  |       |
| 12500.0 | 73.5  |       | 73.6  |       | 76.7  |       |
| 16000.0 | 71.0  |       | 72.3  |       | 75.2  |       |
| 20000.0 | 67.8  |       | 70.1  |       | 73.8  |       |
| 25000.0 | 66.1  |       | 69.3  |       | 72.8  |       |
| 31500.0 | 64.7  |       | 68.7  |       | 71.3  |       |
| 40000.0 | 63.9  |       | 69.0  |       | 70.2  |       |
|         |       |       |       |       |       |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 95.7  |       | 96.7  |       | 97.1  |       |
|         |       |       |       |       | 95.6  |       |
|         |       |       |       |       | 94.9  |       |
|         |       |       |       |       |       | 93.8  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 62.4                                  | 62.7                                  | 62.0                                  | 61.3                                   | 61.2                                   | 61.4                                   |
| 250.0                                  | 64.4                                  | 63.5                                  | 63.6                                  | 63.4                                   | 62.8                                   | 61.8                                   |
| 315.2                                  | 66.8                                  | 66.2                                  | 65.6                                  | 65.3                                   | 64.3                                   | 64.1                                   |
| 400.0                                  | 69.6                                  | 69.0                                  | 67.5                                  | 66.7                                   | 66.7                                   | 65.8                                   |
| 500.0                                  | 71.2                                  | 70.8                                  | 69.6                                  | 68.7                                   | 68.1                                   | 67.4                                   |
| 630.0                                  | 73.4                                  | 72.9                                  | 71.5                                  | 70.9                                   | 70.2                                   | 69.6                                   |
| 800.0                                  | 75.3                                  | 74.7                                  | 73.5                                  | 72.3                                   | 71.8                                   | 71.0                                   |
| 1000.0                                 | 77.0                                  | 76.3                                  | 74.9                                  | 73.9                                   | 73.5                                   | 72.7                                   |
| 1250.0                                 | 77.9                                  | 78.2                                  | 76.7                                  | 75.6                                   | 75.0                                   | 74.4                                   |
| 1600.0                                 | 79.3                                  | 78.9                                  | 77.3                                  | 76.2                                   | 75.9                                   | 75.0                                   |
| 2000.0                                 | 80.1                                  | 80.0                                  | 78.4                                  | 77.3                                   | 76.7                                   | 76.1                                   |
| 2500.0                                 | 80.4                                  | 80.2                                  | 78.8                                  | 77.8                                   | 77.5                                   | 76.7                                   |
| 3150.0                                 | 80.8                                  | 80.6                                  | 79.6                                  | 78.7                                   | 78.0                                   | 77.5                                   |
| 4000.0                                 | 81.2                                  | 81.3                                  | 80.0                                  | 78.9                                   | 78.5                                   | 77.9                                   |
| 5000.0                                 | 81.3                                  | 81.5                                  | 80.2                                  | 79.1                                   | 78.8                                   | 78.4                                   |
| 6300.0                                 | 81.2                                  | 81.3                                  | 79.9                                  | 79.2                                   | 78.8                                   | 78.5                                   |
| 8000.0                                 | 80.9                                  | 81.1                                  | 79.7                                  | 78.8                                   | 78.7                                   | 78.6                                   |
| 10000.0                                | 80.7                                  | 80.7                                  | 79.1                                  | 78.5                                   | 78.3                                   | 78.7                                   |
| 12500.0                                | 80.3                                  | 80.2                                  | 78.9                                  | 78.0                                   | 78.0                                   | 78.3                                   |
| 16000.0                                | 79.7                                  | 79.5                                  | 78.6                                  | 77.2                                   | 77.7                                   | 77.7                                   |
| 20000.0                                | 79.0                                  | 78.5                                  | 77.8                                  | 76.3                                   | 76.8                                   | 76.5                                   |
| 25000.0                                | 78.8                                  | 77.9                                  | 77.6                                  | 75.6                                   | 76.4                                   | 75.8                                   |
| 31500.0                                | 78.1                                  | 76.6                                  | 76.7                                  | 74.4                                   | 75.5                                   | 74.4                                   |
| 40000.0                                | 78.3                                  | 76.0                                  | 75.7                                  | 73.5                                   | 75.3                                   | 73.3                                   |
| OVERALL<br>SPL                         | 92.4                                  | 92.2                                  | 91.0                                  | 89.9                                   | 89.8                                   | 89.4                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 3.64 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 326.00 DEG.F, CHAMBER TEMPERATURE = 54.00 DEG.F  
RELATIVE HUMIDITY = 70.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 137

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $Pr = 1.260$   
TEMPERATURE RATIO  $Tr = 1.529$   
MACH NUMBER  $MJ = 0.586$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.433$   
JET DENSITY RATIO  $DJ/D0 = 0.698$   
JET VELOCITY RATIO  $VJ/A0 = 0.702$   
JET VELOCITY  $VJ = 779.8$  FPS

$TR/TJ = 1.067$   
 $DR/DU = 0.824$   
 $DR/DJ = 1.181$   
MASS FLOW = 0.896 POUNDS PER SECOND  
THRUST = 22.14 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE | ANGLE | PHONE | ANGLE | PHONE | ANGLE | PHONE | ANGLE | PHONE | ANGLE | PHONE | ANGLE |
| FREQ.   | NO.   |       | NO.   |       | NO.   |       | NO.   |       | NO.   |       | NO.   |       |
| HZ      | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  | 13    | 105.0 | 14    | 112.5 | 15    | 120.0 |
| 200.0   | 58.8  |       | 61.0  |       | 60.7  |       | 60.6  |       | 58.9  |       | 57.6  |       |
| 250.0   | 62.2  |       | 62.3  |       | 61.2  |       | 60.7  |       | 61.0  |       | 60.5  |       |
| 315.2   | 64.4  |       | 64.9  |       | 64.0  |       | 64.4  |       | 63.6  |       | 62.9  |       |
| 400.0   | 67.9  |       | 67.4  |       | 66.1  |       | 65.6  |       | 65.0  |       | 65.4  |       |
| 500.0   | 70.2  |       | 69.4  |       | 69.0  |       | 68.2  |       | 67.3  |       | 67.0  |       |
| 630.0   | 72.4  |       | 71.3  |       | 70.7  |       | 69.9  |       | 69.0  |       | 69.2  |       |
| 800.0   | 74.9  |       | 73.8  |       | 72.2  |       | 70.9  |       | 70.6  |       | 70.2  |       |
| 1000.0  | 76.1  |       | 74.8  |       | 73.0  |       | 72.3  |       | 71.6  |       | 70.8  |       |
| 1250.0  | 78.0  |       | 76.1  |       | 75.3  |       | 74.2  |       | 73.4  |       | 72.5  |       |
| 1600.0  | 78.6  |       | 76.8  |       | 75.7  |       | 74.8  |       | 74.3  |       | 73.5  |       |
| 2000.0  | 79.0  |       | 77.9  |       | 76.8  |       | 75.9  |       | 75.3  |       | 74.6  |       |
| 2500.0  | 79.4  |       | 78.4  |       | 77.1  |       | 76.3  |       | 75.9  |       | 75.0  |       |
| 3150.0  | 79.9  |       | 78.8  |       | 77.7  |       | 77.1  |       | 76.6  |       | 75.9  |       |
| 4000.0  | 80.1  |       | 79.2  |       | 78.1  |       | 77.3  |       | 76.7  |       | 76.1  |       |
| 5000.0  | 79.6  |       | 79.4  |       | 78.1  |       | 77.2  |       | 76.7  |       | 76.0  |       |
| 6300.0  | 79.8  |       | 80.1  |       | 78.4  |       | 77.5  |       | 77.3  |       | 76.6  |       |
| 8000.0  | 79.7  |       | 80.2  |       | 77.1  |       | 77.2  |       | 76.6  |       | 76.0  |       |
| 10000.0 | 79.8  |       | 79.9  |       | 77.4  |       | 76.9  |       | 76.4  |       | 75.9  |       |
| 12500.0 | 79.6  |       | 78.0  |       | 76.9  |       | 76.1  |       | 75.9  |       | 74.9  |       |
| 16000.0 | 77.8  |       | 78.2  |       | 75.5  |       | 75.5  |       | 75.3  |       | 74.6  |       |
| 20000.0 | 75.6  |       | 77.5  |       | 74.9  |       | 74.4  |       | 74.2  |       | 73.8  |       |
| 25000.0 | 76.0  |       | 76.2  |       | 74.2  |       | 73.6  |       | 73.6  |       | 73.6  |       |
| 31500.0 | 75.1  |       | 76.1  |       | 73.5  |       | 72.7  |       | 73.1  |       | 73.5  |       |
| 40000.0 | 73.8  |       | 75.9  |       | 73.0  |       | 72.8  |       | 72.3  |       | 73.9  |       |
| OVERALL |       |       |       |       |       |       |       |       |       |       |       |       |
| SPL     | 91.0  |       | 90.7  |       | 88.9  |       | 88.3  |       | 87.9  |       | 87.3  |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 58.3  |       | 59.4  |       | 58.7  |       | 59.2  |  |
| 250.0   |       | 60.9  |       | 60.4  |       | 60.2  |       | 59.9  |  |
| 315.2   |       | 62.3  |       | 61.4  |       | 61.6  |       | 61.4  |  |
| 400.0   |       | 64.4  |       | 63.4  |       | 63.2  |       | 62.8  |  |
| 500.0   |       | 66.6  |       | 64.7  |       | 64.8  |       | 63.6  |  |
| 630.0   |       | 69.0  |       | 68.1  |       | 66.6  |       | 64.6  |  |
| 800.0   |       | 69.6  |       | 68.4  |       | 67.8  |       | 66.4  |  |
| 1000.0  |       | 70.6  |       | 69.3  |       | 68.7  |       | 67.6  |  |
| 1250.0  |       | 72.1  |       | 71.0  |       | 69.9  |       | 67.9  |  |
| 1600.0  |       | 72.9  |       | 71.6  |       | 70.3  |       | 69.0  |  |
| 2000.0  |       | 74.1  |       | 73.0  |       | 71.6  |       | 69.6  |  |
| 2500.0  |       | 74.8  |       | 73.5  |       | 71.9  |       | 69.9  |  |
| 3150.0  |       | 75.6  |       | 74.2  |       | 72.6  |       | 70.4  |  |
| 4000.0  |       | 76.2  |       | 74.5  |       | 72.9  |       | 70.3  |  |
| 5000.0  |       | 76.1  |       | 74.1  |       | 72.5  |       | 70.0  |  |
| 6300.0  |       | 76.6  |       | 74.8  |       | 72.7  |       | 70.7  |  |
| 8000.0  |       | 76.3  |       | 74.5  |       | 72.0  |       | 70.1  |  |
| 10000.0 |       | 76.1  |       | 73.7  |       | 71.5  |       | 69.4  |  |
| 12500.0 |       | 75.4  |       | 73.2  |       | 70.6  |       | 68.7  |  |
| 16000.0 |       | 75.1  |       | 72.7  |       | 70.1  |       | 67.7  |  |
| 20000.0 |       | 74.2  |       | 71.8  |       | 68.9  |       | 66.5  |  |
| 25000.0 |       | 73.5  |       | 71.2  |       | 68.2  |       | 65.5  |  |
| 31500.0 |       | 72.9  |       | 70.7  |       | 67.6  |       | 64.4  |  |
| 40000.0 |       | 72.6  |       | 70.9  |       | 66.7  |       | 63.6  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 87.3  |       | 85.5  |       | 83.6  |       | 81.5  |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.94 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 366.00 DEG.F, CHAMBER TEMPERATURE = 79.50 DEG.F  
RELATIVE HUMIDITY = 44.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 38

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.348$   
TEMPERATURE RATIO  $TR = 1.531$   
MACH NUMBER  $MJ = 0.669$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.408$   
JET DENSITY RATIO  $DJ/D0 = 0.710$   
JET VELOCITY RATIO  $VJ/A0 = 0.794$   
JET VELOCITY  $VJ = 904.3$  FPS

$TR/TJ = 1.087$   
 $DR/D0 = 0.880$   
 $DR/DJ = 1.240$   
MASS FLOW = 1.033 POUNDS PER SECOND  
THRUST = 28.88 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO |       |
| CENTER  | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 78.5  | 78.1  | 73.7  | 70.4  | 70.1  | 66.8  |       |       |       |       |       |       |
| 250.0   | 81.5  | 80.6  | 78.4  | 75.2  | 72.6  | 70.0  |       |       |       |       |       |       |
| 315.2   | 84.9  | 83.2  | 82.5  | 78.0  | 76.2  | 73.2  |       |       |       |       |       |       |
| 400.0   | 87.4  | 87.1  | 83.9  | 80.8  | 79.0  | 76.6  |       |       |       |       |       |       |
| 500.0   | 90.2  | 88.3  | 87.3  | 83.1  | 81.4  | 78.4  |       |       |       |       |       |       |
| 630.0   | 89.5  | 90.2  | 90.3  | 86.1  | 83.9  | 80.4  |       |       |       |       |       |       |
| 800.0   | 93.1  | 92.8  | 91.9  | 88.2  | 85.9  | 82.9  |       |       |       |       |       |       |
| 1000.0  | 92.2  | 93.2  | 92.8  | 89.6  | 87.4  | 84.3  |       |       |       |       |       |       |
| 1250.0  | 91.8  | 94.1  | 93.7  | 90.6  | 88.9  | 85.7  |       |       |       |       |       |       |
| 1600.0  | 89.5  | 91.8  | 92.1  | 90.2  | 89.2  | 87.0  |       |       |       |       |       |       |
| 2000.0  | 86.6  | 90.0  | 91.4  | 90.4  | 89.9  | 87.9  |       |       |       |       |       |       |
| 2500.0  | 83.9  | 87.9  | 89.8  | 89.6  | 89.9  | 88.0  |       |       |       |       |       |       |
| 3150.0  | 81.9  | 86.2  | 88.1  | 89.0  | 89.7  | 88.1  |       |       |       |       |       |       |
| 4000.0  | 80.9  | 84.9  | 87.1  | 88.0  | 89.7  | 88.1  |       |       |       |       |       |       |
| 5000.0  | 79.6  | 83.6  | 85.6  | 86.7  | 89.1  | 88.2  |       |       |       |       |       |       |
| 6300.0  | 78.9  | 82.3  | 84.3  | 85.8  | 88.3  | 87.6  |       |       |       |       |       |       |
| 8000.0  | 78.5  | 80.9  | 83.0  | 84.8  | 87.6  | 87.2  |       |       |       |       |       |       |
| 10000.0 | 78.8  | 80.7  | 81.9  | 83.2  | 86.8  | 86.7  |       |       |       |       |       |       |
| 12500.0 | 77.5  | 78.4  | 80.8  | 82.5  | 86.1  | 86.0  |       |       |       |       |       |       |
| 16000.0 | 75.0  | 77.2  | 79.3  | 81.3  | 85.0  | 85.1  |       |       |       |       |       |       |
| 20000.0 | 71.8  | 75.1  | 77.8  | 79.8  | 83.5  | 84.2  |       |       |       |       |       |       |
| 25000.0 | 70.0  | 74.3  | 76.9  | 78.5  | 82.5  | 83.7  |       |       |       |       |       |       |
| 31500.0 | 68.1  | 73.2  | 75.3  | 76.5  | 81.0  | 82.7  |       |       |       |       |       |       |
| 40000.0 | 66.4  | 72.4  | 73.9  | 75.4  | 79.6  | 81.9  |       |       |       |       |       |       |
| OVERALL |       |       |       |       |       |       |       |       |       |       |       |       |
| SPL     | 100.2 | 101.4 | 101.6 | 100.0 | 100.3 | 99.0  |       |       |       |       |       |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 64.2                | 64.9                | 64.0                | 63.8                 | 64.8                 | 62.8                 |
| 250.0                   | 67.9                | 66.6                | 66.3                | 66.7                 | 66.0                 | 65.2                 |
| 315.2                   | 70.5                | 69.0                | 68.7                | 68.6                 | 67.4                 | 67.0                 |
| 400.0                   | 73.5                | 72.0                | 70.4                | 70.3                 | 69.8                 | 68.8                 |
| 500.0                   | 74.9                | 73.2                | 72.3                | 71.3                 | 70.7                 | 69.6                 |
| 630.0                   | 78.1                | 76.3                | 74.9                | 74.3                 | 73.7                 | 72.3                 |
| 800.0                   | 80.1                | 78.2                | 76.5                | 76.1                 | 75.4                 | 74.8                 |
| 1000.0                  | 81.8                | 80.1                | 78.4                | 77.4                 | 76.7                 | 75.7                 |
| 1250.0                  | 83.6                | 81.7                | 80.3                | 79.4                 | 78.4                 | 77.9                 |
| 1600.0                  | 84.8                | 82.4                | 81.0                | 80.1                 | 79.4                 | 78.6                 |
| 2000.0                  | 85.8                | 83.6                | 82.5                | 81.2                 | 80.4                 | 79.6                 |
| 2500.0                  | 86.0                | 84.2                | 83.0                | 81.7                 | 81.2                 | 80.5                 |
| 3150.0                  | 86.4                | 84.8                | 83.6                | 82.7                 | 82.0                 | 81.3                 |
| 4000.0                  | 87.0                | 85.5                | 84.0                | 83.2                 | 82.5                 | 81.9                 |
| 5000.0                  | 87.3                | 85.9                | 84.3                | 83.6                 | 82.8                 | 82.3                 |
| 6300.0                  | 87.0                | 85.8                | 84.2                | 83.6                 | 83.0                 | 82.8                 |
| 8000.0                  | 86.7                | 85.7                | 84.1                | 83.4                 | 82.8                 | 82.7                 |
| 10000.0                 | 86.3                | 85.4                | 83.6                | 83.0                 | 82.6                 | 82.7                 |
| 12500.0                 | 86.1                | 85.1                | 83.4                | 82.5                 | 82.4                 | 82.4                 |
| 16000.0                 | 85.3                | 84.7                | 83.3                | 81.9                 | 82.1                 | 82.0                 |
| 20000.0                 | 84.5                | 83.9                | 82.6                | 81.0                 | 81.1                 | 80.9                 |
| 25000.0                 | 83.9                | 83.2                | 82.4                | 80.6                 | 80.6                 | 80.2                 |
| 31500.0                 | 82.6                | 82.2                | 81.6                | 79.2                 | 79.7                 | 78.9                 |
| 40000.0                 | 81.4                | 81.8                | 80.7                | 78.2                 | 79.2                 | 78.0                 |
| OVERALL<br>SPL          | 97.9                | 96.6                | 95.2                | 94.2                 | 93.8                 | 93.4                 |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.87 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 338.00 DEG.F, CHAMBER TEMPERATURE = 54.00 DEG.F  
RELATIVE HUMIDITY = 70.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 138

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.348  
TEMPERATURE RATIO TR = 1.553  
MACH NUMBER MJ = 0.669  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.428  
JET DENSITY RATIO DJ/D0 = 0.700  
JET VELOCITY RATIO VJ/A0 = 0.800  
JET VELOCITY VJ = 888.8 FPS

TR/TJ = 1.087  
DR/D0 = 0.868  
DR/DJ = 1.240  
MASS FLOW = 1.026 POUNDS PER SECOND  
THRUST = 28.88 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>120.0 |
|--|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 61.8                        |               | 64.1                        |               | 64.0                        |               | 62.8                        |                | 62.2                        |                | 59.8                        |                |
| 250.0                                  | 65.3                        |               | 65.3                        |               | 63.6                        |               | 63.0                        |                | 63.3                        |                | 62.4                        |                |
| 315.2                                  | 67.6                        |               | 67.4                        |               | 67.0                        |               | 66.9                        |                | 66.5                        |                | 65.8                        |                |
| 400.0                                  | 70.2                        |               | 70.0                        |               | 69.2                        |               | 68.1                        |                | 68.0                        |                | 67.6                        |                |
| 500.0                                  | 72.7                        |               | 71.9                        |               | 71.5                        |               | 71.5                        |                | 70.7                        |                | 70.1                        |                |
| 630.0                                  | 75.3                        |               | 74.2                        |               | 73.8                        |               | 73.0                        |                | 72.4                        |                | 72.4                        |                |
| 800.0                                  | 77.5                        |               | 76.6                        |               | 75.5                        |               | 74.0                        |                | 73.6                        |                | 73.2                        |                |
| 1000.0                                 | 79.5                        |               | 77.9                        |               | 76.5                        |               | 75.4                        |                | 74.7                        |                | 73.9                        |                |
| 1250.0                                 | 81.0                        |               | 79.3                        |               | 78.5                        |               | 77.4                        |                | 76.6                        |                | 75.6                        |                |
| 1600.0                                 | 81.8                        |               | 80.2                        |               | 79.0                        |               | 78.0                        |                | 77.4                        |                | 76.5                        |                |
| 2000.0                                 | 82.6                        |               | 81.4                        |               | 80.2                        |               | 79.3                        |                | 78.1                        |                | 77.6                        |                |
| 2500.0                                 | 82.8                        |               | 81.9                        |               | 80.6                        |               | 79.9                        |                | 79.1                        |                | 78.4                        |                |
| 3150.0                                 | 83.5                        |               | 82.3                        |               | 81.5                        |               | 80.8                        |                | 79.9                        |                | 79.3                        |                |
| 4000.0                                 | 83.8                        |               | 83.1                        |               | 82.1                        |               | 81.4                        |                | 80.4                        |                | 79.7                        |                |
| 5000.0                                 | 83.5                        |               | 83.1                        |               | 82.3                        |               | 81.2                        |                | 80.5                        |                | 79.8                        |                |
| 6300.0                                 | 83.8                        |               | 84.0                        |               | 82.4                        |               | 81.8                        |                | 81.0                        |                | 80.4                        |                |
| 8000.0                                 | 83.8                        |               | 84.2                        |               | 81.6                        |               | 81.3                        |                | 80.4                        |                | 79.8                        |                |
| 10000.0                                | 84.0                        |               | 83.6                        |               | 81.6                        |               | 80.9                        |                | 80.1                        |                | 79.6                        |                |
| 12500.0                                | 83.8                        |               | 82.2                        |               | 81.6                        |               | 80.5                        |                | 79.7                        |                | 78.9                        |                |
| 16000.0                                | 82.2                        |               | 82.3                        |               | 80.2                        |               | 80.1                        |                | 79.1                        |                | 78.6                        |                |
| 20000.0                                | 80.3                        |               | 81.9                        |               | 79.9                        |               | 79.2                        |                | 78.0                        |                | 77.9                        |                |
| 25000.0                                | 80.6                        |               | 80.6                        |               | 79.2                        |               | 78.5                        |                | 77.5                        |                | 77.6                        |                |
| 31500.0                                | 80.0                        |               | 80.6                        |               | 78.7                        |               | 78.0                        |                | 77.0                        |                | 77.5                        |                |
| 40000.0                                | 78.7                        |               | 80.4                        |               | 78.3                        |               | 78.2                        |                | 76.2                        |                | 77.8                        |                |
| OVERALL<br>SPL                         | 94.9                        |               | 94.5                        |               | 93.0                        |               | 92.3                        |                | 91.4                        |                | 91.0                        |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16 | ANGLE<br>127.5 | MICRO<br>PHONE<br>NO. 17 | ANGLE<br>135.0 | MICRO<br>PHONE<br>NO. 18 | ANGLE<br>142.5 | MICRO<br>PHONE<br>NO. 19 | ANGLE<br>150.0 |
|--|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|
| 200.0                                  | 60.1                     |                | 61.2                     |                | 61.2                     |                | 61.6                     |                |
| 250.0                                  | 63.5                     |                | 62.6                     |                | 62.2                     |                | 63.1                     |                |
| 315.2                                  | 65.0                     |                | 64.0                     |                | 63.4                     |                | 64.1                     |                |
| 400.0                                  | 67.3                     |                | 66.0                     |                | 65.6                     |                | 66.2                     |                |
| 500.0                                  | 69.9                     |                | 68.5                     |                | 67.7                     |                | 66.6                     |                |
| 630.0                                  | 72.0                     |                | 71.3                     |                | 69.7                     |                | 67.2                     |                |
| 800.0                                  | 72.1                     |                | 71.5                     |                | 70.7                     |                | 69.2                     |                |
| 1000.0                                 | 73.4                     |                | 72.2                     |                | 71.7                     |                | 70.4                     |                |
| 1250.0                                 | 74.9                     |                | 74.0                     |                | 72.7                     |                | 71.0                     |                |
| 1600.0                                 | 75.7                     |                | 74.6                     |                | 73.4                     |                | 72.1                     |                |
| 2000.0                                 | 77.2                     |                | 76.2                     |                | 75.0                     |                | 73.0                     |                |
| 2500.0                                 | 77.8                     |                | 76.6                     |                | 75.5                     |                | 73.5                     |                |
| 3150.0                                 | 78.8                     |                | 77.8                     |                | 76.3                     |                | 74.3                     |                |
| 4000.0                                 | 79.5                     |                | 78.1                     |                | 76.9                     |                | 74.3                     |                |
| 5000.0                                 | 79.5                     |                | 77.9                     |                | 76.6                     |                | 73.9                     |                |
| 6300.0                                 | 80.1                     |                | 78.5                     |                | 76.8                     |                | 74.5                     |                |
| 8000.0                                 | 79.7                     |                | 78.4                     |                | 76.1                     |                | 73.8                     |                |
| 10000.0                                | 79.4                     |                | 77.8                     |                | 75.7                     |                | 73.0                     |                |
| 12500.0                                | 78.9                     |                | 77.5                     |                | 74.9                     |                | 72.4                     |                |
| 16000.0                                | 78.6                     |                | 77.1                     |                | 74.6                     |                | 71.4                     |                |
| 20000.0                                | 77.7                     |                | 76.1                     |                | 73.5                     |                | 70.0                     |                |
| 25000.0                                | 77.1                     |                | 75.4                     |                | 72.9                     |                | 68.8                     |                |
| 31500.0                                | 76.7                     |                | 75.0                     |                | 72.3                     |                | 67.8                     |                |
| 40000.0                                | 76.2                     |                | 75.1                     |                | 71.6                     |                | 66.7                     |                |
| OVERALL<br>SPL                         | 90.6                     |                | 89.2                     |                | 87.4                     |                | 85.1                     |                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 6.43 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 384.00 DEG.F, CHAMBER TEMPERATURE = 80.00 DEG.F  
RELATIVE HUMIDITY = 44.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 39

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.453$   
TEMPERATURE RATIO  $T_r = 1.563$   
MACH NUMBER  $M_J = 0.753$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.407$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.710$   
JET VELOCITY RATIO  $V_J/A_0 = 0.893$   
JET VELOCITY  $V_J = 1017.2$  FPS

$T_r/T_J = 1.110$   
 $\rho_r/\rho_0 = 0.930$   
 $\rho_r/\rho_J = 1.308$   
MASS FLOW = 1.162 POUNDS PER SECOND  
THRUST = 36.52 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>1 15.0 | MICRO<br>PHONE<br>NO. ANGLE<br>2 22.5 | MICRO<br>PHONE<br>NO. ANGLE<br>3 30.0 | MICRO<br>PHONE<br>NO. ANGLE<br>4 37.5 | MICRO<br>PHONE<br>NO. ANGLE<br>5 45.0 | MICRO<br>PHONE<br>NO. ANGLE<br>6 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 80.5                                  | 80.9                                  | 77.0                                  | 74.8                                  | 72.7                                  | 69.8                                  |
| 250.0                                  | 83.4                                  | 83.4                                  | 80.8                                  | 77.8                                  | 75.9                                  | 72.8                                  |
| 315.2                                  | 87.8                                  | 86.0                                  | 85.0                                  | 80.8                                  | 79.4                                  | 76.3                                  |
| 400.0                                  | 90.7                                  | 91.0                                  | 87.2                                  | 85.0                                  | 82.2                                  | 79.7                                  |
| 500.0                                  | 93.6                                  | 92.2                                  | 90.4                                  | 87.5                                  | 85.2                                  | 81.0                                  |
| 630.0                                  | 93.4                                  | 94.2                                  | 93.6                                  | 90.1                                  | 87.2                                  | 83.7                                  |
| 800.0                                  | 96.6                                  | 96.8                                  | 95.6                                  | 92.3                                  | 89.9                                  | 86.4                                  |
| 1000.0                                 | 96.2                                  | 97.6                                  | 97.4                                  | 94.2                                  | 92.2                                  | 88.6                                  |
| 1250.0                                 | 96.3                                  | 98.7                                  | 98.8                                  | 95.9                                  | 93.4                                  | 90.1                                  |
| 1600.0                                 | 94.8                                  | 97.1                                  | 98.0                                  | 95.4                                  | 93.7                                  | 90.8                                  |
| 2000.0                                 | 92.7                                  | 95.3                                  | 96.6                                  | 95.3                                  | 94.6                                  | 91.9                                  |
| 2500.0                                 | 89.2                                  | 92.7                                  | 94.5                                  | 94.1                                  | 94.3                                  | 92.0                                  |
| 3150.0                                 | 86.3                                  | 90.7                                  | 92.5                                  | 93.4                                  | 94.4                                  | 92.4                                  |
| 4000.0                                 | 84.9                                  | 89.2                                  | 91.8                                  | 92.6                                  | 94.3                                  | 92.5                                  |
| 5000.0                                 | 83.2                                  | 88.1                                  | 90.2                                  | 91.1                                  | 93.7                                  | 92.5                                  |
| 6300.0                                 | 82.4                                  | 86.6                                  | 88.9                                  | 90.2                                  | 92.9                                  | 92.3                                  |
| 8000.0                                 | 81.8                                  | 85.7                                  | 87.6                                  | 89.2                                  | 92.0                                  | 91.6                                  |
| 10000.0                                | 81.1                                  | 84.9                                  | 84.9                                  | 88.2                                  | 91.2                                  | 91.1                                  |
| 12500.0                                | 80.6                                  | 83.3                                  | 85.3                                  | 87.2                                  | 90.5                                  | 90.7                                  |
| 16000.0                                | 78.3                                  | 81.9                                  | 83.8                                  | 85.8                                  | 89.4                                  | 89.9                                  |
| 20000.0                                | 75.3                                  | 80.2                                  | 82.3                                  | 84.5                                  | 87.9                                  | 89.0                                  |
| 25000.0                                | 73.5                                  | 79.4                                  | 81.2                                  | 83.3                                  | 86.9                                  | 88.4                                  |
| 31500.0                                | 72.2                                  | 78.7                                  | 79.5                                  | 81.3                                  | 85.3                                  | 87.6                                  |
| 40000.0                                | 72.1                                  | 79.7                                  | 78.4                                  | 80.1                                  | 84.0                                  | 86.8                                  |
| OVERALL<br>SPL                         | 104.3                                 | 105.9                                 | 106.2                                 | 104.7                                 | 104.8                                 | 103.3                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 68.3                                  | 67.7                                  | 67.5                                  | 67.2                                   | 66.2                                   | 66.8                                   |
| 250.0                                  | 71.0                                  | 69.8                                  | 69.0                                  | 68.6                                   | 68.7                                   | 68.5                                   |
| 315.2                                  | 73.8                                  | 72.0                                  | 71.4                                  | 71.5                                   | 71.0                                   | 70.1                                   |
| 400.0                                  | 76.8                                  | 74.8                                  | 73.3                                  | 72.9                                   | 73.3                                   | 72.3                                   |
| 500.0                                  | 78.7                                  | 76.4                                  | 75.3                                  | 74.4                                   | 74.0                                   | 72.9                                   |
| 630.0                                  | 80.9                                  | 79.0                                  | 77.8                                  | 76.7                                   | 76.3                                   | 75.3                                   |
| 800.0                                  | 83.3                                  | 81.0                                  | 79.5                                  | 78.9                                   | 78.4                                   | 77.5                                   |
| 1000.0                                 | 85.0                                  | 82.8                                  | 81.4                                  | 80.4                                   | 79.5                                   | 78.7                                   |
| 1250.0                                 | 86.8                                  | 84.9                                  | 83.5                                  | 82.7                                   | 81.6                                   | 80.8                                   |
| 1600.0                                 | 88.3                                  | 85.8                                  | 84.6                                  | 83.4                                   | 82.5                                   | 81.7                                   |
| 2000.0                                 | 89.3                                  | 87.3                                  | 85.9                                  | 84.5                                   | 83.4                                   | 82.8                                   |
| 2500.0                                 | 89.8                                  | 87.9                                  | 86.3                                  | 85.2                                   | 84.4                                   | 83.9                                   |
| 3150.0                                 | 90.4                                  | 88.7                                  | 87.2                                  | 86.2                                   | 85.6                                   | 84.7                                   |
| 4000.0                                 | 90.8                                  | 89.5                                  | 87.7                                  | 86.6                                   | 85.8                                   | 85.1                                   |
| 5000.0                                 | 91.1                                  | 89.8                                  | 88.1                                  | 87.0                                   | 86.4                                   | 85.8                                   |
| 6300.0                                 | 91.0                                  | 89.8                                  | 88.0                                  | 87.3                                   | 86.5                                   | 86.1                                   |
| 8000.0                                 | 90.9                                  | 89.9                                  | 88.2                                  | 87.0                                   | 86.5                                   | 86.1                                   |
| 10000.0                                | 90.7                                  | 89.7                                  | 87.8                                  | 86.8                                   | 86.4                                   | 86.1                                   |
| 12500.0                                | 90.4                                  | 89.3                                  | 87.7                                  | 86.6                                   | 86.1                                   | 85.9                                   |
| 16000.0                                | 89.8                                  | 89.1                                  | 87.7                                  | 86.1                                   | 85.9                                   | 85.4                                   |
| 20000.0                                | 89.0                                  | 88.2                                  | 87.2                                  | 85.3                                   | 85.2                                   | 84.4                                   |
| 25000.0                                | 88.4                                  | 87.7                                  | 87.1                                  | 84.8                                   | 84.6                                   | 83.7                                   |
| 31500.0                                | 87.0                                  | 86.6                                  | 86.3                                  | 83.6                                   | 83.7                                   | 82.6                                   |
| 40000.0                                | 86.0                                  | 86.0                                  | 85.5                                  | 82.6                                   | 83.3                                   | 81.7                                   |
| OVERALL<br>SPL                         | 101.9                                 | 100.6                                 | 99.2                                  | 97.9                                   | 97.4                                   | 96.7                                   |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 6.34 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 360.00 DEG.F, CHAMBER TEMPERATURE = 55.00 DEG.F  
RELATIVE HUMIDITY = 70.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 139

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.453$   
TEMPERATURE RATIO  $T_R = 1.592$   
MACH NUMBER  $M_J = 0.753$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.434$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.697$   
JET VELOCITY RATIO  $V_J/A_0 = 0.901$   
JET VELOCITY  $V_J = 1002.7$  FPS

$T_R/T_J = 1.110$   
 $\rho_R/\rho_0 = 0.912$   
 $\rho_R/\rho_J = 1.308$   
MASS FLOW = 1.151 POUNDS PER SECOND  
THRUST = 36.52 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 64.8                        | 66.8                        | 67.0                        | 66.1                        | 63.8                        | 63.1                        |
| 250.0                                  | 67.5                        | 67.7                        | 65.9                        | 65.8                        | 65.0                        | 65.5                        |
| 315.2                                  | 69.7                        | 69.9                        | 69.0                        | 68.7                        | 69.0                        | 68.2                        |
| 400.0                                  | 72.4                        | 72.1                        | 71.7                        | 70.8                        | 70.5                        | 70.1                        |
| 500.0                                  | 74.9                        | 74.9                        | 74.4                        | 73.6                        | 73.6                        | 72.9                        |
| 630.0                                  | 77.6                        | 76.8                        | 76.4                        | 75.8                        | 75.6                        | 75.4                        |
| 800.0                                  | 79.4                        | 79.2                        | 78.1                        | 77.0                        | 76.3                        | 76.2                        |
| 1000.0                                 | 81.6                        | 80.6                        | 79.0                        | 78.2                        | 77.2                        | 76.9                        |
| 1250.0                                 | 84.1                        | 82.3                        | 81.0                        | 80.4                        | 79.6                        | 78.9                        |
| 1600.0                                 | 84.5                        | 82.8                        | 82.1                        | 81.0                        | 80.4                        | 79.7                        |
| 2000.0                                 | 85.5                        | 84.1                        | 83.2                        | 82.3                        | 81.2                        | 80.6                        |
| 2500.0                                 | 86.0                        | 85.0                        | 83.7                        | 82.9                        | 82.3                        | 81.5                        |
| 3150.0                                 | 86.9                        | 85.8                        | 84.8                        | 84.1                        | 83.4                        | 82.3                        |
| 4000.0                                 | 87.1                        | 86.2                        | 85.5                        | 84.3                        | 83.8                        | 82.7                        |
| 5000.0                                 | 86.9                        | 86.5                        | 85.9                        | 84.4                        | 84.1                        | 82.9                        |
| 6300.0                                 | 87.3                        | 87.5                        | 86.2                        | 85.0                        | 84.8                        | 83.6                        |
| 8000.0                                 | 87.4                        | 87.9                        | 85.2                        | 85.0                        | 84.2                        | 83.2                        |
| 10000.0                                | 87.9                        | 87.7                        | 85.4                        | 84.6                        | 84.1                        | 82.9                        |
| 12500.0                                | 87.6                        | 86.1                        | 85.3                        | 84.4                        | 83.7                        | 82.5                        |
| 16000.0                                | 86.2                        | 86.1                        | 84.0                        | 83.7                        | 83.0                        | 82.1                        |
| 20000.0                                | 84.2                        | 85.9                        | 83.6                        | 82.8                        | 82.0                        | 81.3                        |
| 25000.0                                | 84.5                        | 84.4                        | 83.0                        | 82.2                        | 81.5                        | 81.1                        |
| 31500.0                                | 83.8                        | 84.4                        | 82.7                        | 81.7                        | 81.1                        | 81.0                        |
| 40000.0                                | 82.7                        | 84.2                        | 82.3                        | 81.7                        | 80.2                        | 81.2                        |
| OVERALL<br>SPL                         | 98.3                        | 98.0                        | 96.5                        | 95.7                        | 95.0                        | 94.2                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>16 | ANGLE<br>127.5 | MICRO<br>PHONE<br>NO.<br>17 | ANGLE<br>135.0 | MICRO<br>PHONE<br>NO.<br>18 | ANGLE<br>142.5 | MICRO<br>PHONE<br>NO.<br>19 | ANGLE<br>150.0 |
|--|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 62.6                        |                | 63.5                        |                | 63.5                        |                | 64.6                        |                |
| 250.0                                  | 65.0                        |                | 65.0                        |                | 64.7                        |                | 65.2                        |                |
| 315.2                                  | 67.2                        |                | 66.8                        |                | 66.3                        |                | 66.7                        |                |
| 400.0                                  | 69.6                        |                | 68.9                        |                | 68.8                        |                | 68.5                        |                |
| 500.0                                  | 72.7                        |                | 71.5                        |                | 70.5                        |                | 69.3                        |                |
| 630.0                                  | 75.5                        |                | 74.5                        |                | 72.8                        |                | 70.1                        |                |
| 800.0                                  | 75.4                        |                | 74.6                        |                | 74.1                        |                | 71.9                        |                |
| 1000.0                                 | 76.4                        |                | 75.4                        |                | 75.0                        |                | 72.7                        |                |
| 1250.0                                 | 77.8                        |                | 77.0                        |                | 76.3                        |                | 74.0                        |                |
| 1600.0                                 | 79.0                        |                | 77.8                        |                | 76.6                        |                | 75.3                        |                |
| 2000.0                                 | 80.1                        |                | 79.2                        |                | 78.1                        |                | 76.1                        |                |
| 2500.0                                 | 80.8                        |                | 79.9                        |                | 78.8                        |                | 76.8                        |                |
| 3150.0                                 | 81.9                        |                | 80.7                        |                | 79.9                        |                | 77.6                        |                |
| 4000.0                                 | 82.7                        |                | 81.5                        |                | 80.3                        |                | 77.7                        |                |
| 5000.0                                 | 82.9                        |                | 81.1                        |                | 80.0                        |                | 77.7                        |                |
| 6300.0                                 | 83.5                        |                | 82.0                        |                | 80.3                        |                | 78.2                        |                |
| 8000.0                                 | 83.2                        |                | 81.8                        |                | 80.0                        |                | 77.6                        |                |
| 10000.0                                | 82.8                        |                | 81.3                        |                | 79.4                        |                | 76.8                        |                |
| 12500.0                                | 82.4                        |                | 80.9                        |                | 78.7                        |                | 76.1                        |                |
| 16000.0                                | 82.1                        |                | 80.4                        |                | 78.2                        |                | 75.1                        |                |
| 20000.0                                | 81.3                        |                | 79.3                        |                | 76.9                        |                | 73.6                        |                |
| 25000.0                                | 80.7                        |                | 78.7                        |                | 76.3                        |                | 72.3                        |                |
| 31500.0                                | 80.1                        |                | 78.3                        |                | 75.6                        |                | 71.3                        |                |
| 40000.0                                | 79.7                        |                | 78.3                        |                | 74.8                        |                | 70.2                        |                |
| OVERALL<br>SPL                         | 93.9                        |                | 92.5                        |                | 90.9                        |                | 88.5                        |                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 11.70 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 440.00 DEG.F, CHAMBER TEMPERATURE = 82.00 DEG.F  
RELATIVE HUMIDITY = 44.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 40

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.824$   
TEMPERATURE RATIO  $TR = 1.561$   
MACH NUMBER  $MJ = 0.971$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.403$   
JET DENSITY RATIO  $DJ/D_0 = 0.713$   
JET VELOCITY RATIO  $VJ/A_0 = 1.150$   
JET VELOCITY  $VJ = 1311.8$  FPS

$TR/TJ = 1.184$   
 $DR/D_0 = 1.098$   
 $DR/DJ = 1.541$   
MASS FLOW = 1.500 POUNDS PER SECOND  
THRUST = 60.71 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 87.8                                  | 87.4                                  | 82.3                                  | 0.0                                   | 78.0                                  | 75.2                                  |
| 250.0                                  | 90.1                                  | 89.8                                  | 87.7                                  | 0.0                                   | 81.8                                  | 78.4                                  |
| 315.2                                  | 95.3                                  | 93.0                                  | 92.5                                  | 0.0                                   | 85.3                                  | 81.5                                  |
| 400.0                                  | 97.5                                  | 98.2                                  | 94.4                                  | 0.0                                   | 88.6                                  | 85.3                                  |
| 500.0                                  | 100.7                                 | 99.2                                  | 97.8                                  | 0.0                                   | 91.5                                  | 87.7                                  |
| 630.0                                  | 100.6                                 | 101.9                                 | 101.3                                 | 0.0                                   | 95.0                                  | 90.4                                  |
| 800.0                                  | 104.0                                 | 105.3                                 | 103.8                                 | 0.0                                   | 97.7                                  | 92.8                                  |
| 1000.0                                 | 103.6                                 | 105.8                                 | 106.3                                 | 0.0                                   | 100.2                                 | 95.7                                  |
| 1250.0                                 | 104.6                                 | 107.9                                 | 108.5                                 | 0.0                                   | 102.8                                 | 97.9                                  |
| 1600.0                                 | 104.7                                 | 108.0                                 | 108.7                                 | 0.0                                   | 103.7                                 | 99.4                                  |
| 2000.0                                 | 104.8                                 | 108.3                                 | 109.0                                 | 0.0                                   | 104.5                                 | 100.1                                 |
| 2500.0                                 | 104.1                                 | 107.5                                 | 107.9                                 | 0.0                                   | 104.0                                 | 100.7                                 |
| 3150.0                                 | 102.7                                 | 106.1                                 | 106.1                                 | 0.0                                   | 103.7                                 | 101.2                                 |
| 4000.0                                 | 100.9                                 | 103.8                                 | 104.2                                 | 0.0                                   | 103.3                                 | 101.3                                 |
| 5000.0                                 | 97.9                                  | 101.3                                 | 101.8                                 | 0.0                                   | 102.6                                 | 101.5                                 |
| 6300.0                                 | 95.4                                  | 99.0                                  | 99.9                                  | 0.0                                   | 101.8                                 | 101.0                                 |
| 8000.0                                 | 93.3                                  | 97.0                                  | 98.4                                  | 0.0                                   | 101.0                                 | 100.3                                 |
| 10000.0                                | 91.6                                  | 94.5                                  | 96.1                                  | 0.0                                   | 100.0                                 | 100.0                                 |
| 12500.0                                | 90.1                                  | 93.8                                  | 95.8                                  | 0.0                                   | 99.3                                  | 99.1                                  |
| 16000.0                                | 87.9                                  | 92.2                                  | 94.3                                  | 0.0                                   | 98.1                                  | 98.1                                  |
| 20000.0                                | 85.2                                  | 90.2                                  | 92.8                                  | 0.0                                   | 96.7                                  | 97.3                                  |
| 25000.0                                | 83.3                                  | 88.9                                  | 91.7                                  | 0.0                                   | 95.7                                  | 96.9                                  |
| 31500.0                                | 80.8                                  | 87.1                                  | 89.9                                  | 0.0                                   | 94.3                                  | 95.7                                  |
| 40000.0                                | 78.7                                  | 85.9                                  | 88.3                                  | 0.0                                   | 92.8                                  | 94.8                                  |
| OVERALL<br>SPL                         | 113.9                                 | 116.6                                 | 116.9                                 | 104.7                                 | 113.9                                 | 111.8                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 72.7                | 74.1                | 73.9                | 72.6                 | 73.0                 | 72.3                 |
| 250.0                   | 76.4                | 75.6                | 75.0                | 74.6                 | 75.0                 | 73.9                 |
| 315.2                   | 79.0                | 78.4                | 78.1                | 77.5                 | 76.7                 | 76.4                 |
| 400.0                   | 82.2                | 81.0                | 80.0                | 79.6                 | 79.6                 | 78.1                 |
| 500.0                   | 83.6                | 82.7                | 81.6                | 80.8                 | 80.3                 | 79.4                 |
| 630.0                   | 86.8                | 85.0                | 84.2                | 83.1                 | 82.5                 | 81.6                 |
| 800.0                   | 89.0                | 87.2                | 86.2                | 85.0                 | 84.7                 | 83.8                 |
| 1000.0                  | 91.2                | 89.3                | 88.1                | 86.8                 | 85.9                 | 85.2                 |
| 1250.0                  | 93.7                | 91.6                | 90.2                | 88.9                 | 87.9                 | 87.3                 |
| 1600.0                  | 95.2                | 93.0                | 91.4                | 89.9                 | 89.3                 | 88.5                 |
| 2000.0                  | 96.9                | 94.5                | 93.0                | 91.2                 | 90.5                 | 89.6                 |
| 2500.0                  | 97.5                | 95.4                | 93.8                | 92.0                 | 91.5                 | 90.6                 |
| 3150.0                  | 98.3                | 96.5                | 94.5                | 92.9                 | 92.3                 | 91.4                 |
| 4000.0                  | 98.9                | 97.3                | 95.7                | 93.7                 | 93.0                 | 92.1                 |
| 5000.0                  | 99.1                | 97.9                | 96.0                | 94.2                 | 93.8                 | 92.9                 |
| 6300.0                  | 99.2                | 98.1                | 96.1                | 94.6                 | 94.1                 | 93.5                 |
| 8000.0                  | 99.1                | 98.1                | 96.3                | 94.6                 | 94.3                 | 93.8                 |
| 10000.0                 | 98.8                | 98.1                | 96.1                | 94.7                 | 94.3                 | 94.1                 |
| 12500.0                 | 98.4                | 97.9                | 96.3                | 94.6                 | 94.1                 | 94.3                 |
| 16000.0                 | 97.7                | 97.6                | 96.3                | 94.2                 | 94.0                 | 94.0                 |
| 20000.0                 | 97.0                | 96.8                | 95.7                | 93.6                 | 93.4                 | 93.1                 |
| 25000.0                 | 96.1                | 96.3                | 95.8                | 93.2                 | 93.0                 | 92.5                 |
| 31500.0                 | 94.6                | 95.3                | 95.0                | 92.1                 | 92.2                 | 91.6                 |
| 40000.0                 | 93.5                | 94.7                | 94.2                | 91.0                 | 91.8                 | 90.6                 |
| OVERALL<br>SPL          | 109.7               | 108.7               | 107.3               | 105.4                | 105.0                | 104.5                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 11.54 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 412.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 62.0 PERCENT  
GAMMA = 1.390

RUN NUMBER 140

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R$  = 1.824  
TEMPERATURE RATIO  $T_R$  = 1.587  
MACH NUMBER  $M_J$  = 0.971  
JET STATIC TEMPERATURE RATIO  $T_J/T_0$  = 1.425  
JET DENSITY RATIO  $D_J/D_0$  = 0.702  
JET VELOCITY RATIO  $V_J/A_0$  = 1.159  
JET VELOCITY  $V_J$  = 1291.4 FPS

$T_R/T_J$  = 1.184  
 $D_R/D_0$  = 1.082  
 $D_R/D_J$  = 1.541  
MASS FLOW = 1.489 POUNDS PER SECOND  
THRUST = 60.73 POUNDS

SHOCK CELL LENGTH  $S$  = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE        | MICRO<br>PHONE        | MICRO<br>PHONE        |
|-------------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| FREQ.<br>HZ             | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 | NO. 13<br>ANGLE 105.0 | NO. 14<br>ANGLE 112.5 | NO. 15<br>ANGLE 120.0 |
| 200.0                   | 69.4                 | 71.7                 | 71.8                 | 71.0                  | 70.1                  | 67.7                  |
| 250.0                   | 73.2                 | 72.4                 | 71.8                 | 70.5                  | 69.8                  | 69.0                  |
| 315.2                   | 74.1                 | 74.0                 | 73.9                 | 72.3                  | 73.0                  | 72.5                  |
| 400.0                   | 76.9                 | 77.3                 | 76.2                 | 75.6                  | 75.8                  | 75.5                  |
| 500.0                   | 79.8                 | 79.0                 | 78.9                 | 79.0                  | 79.0                  | 78.7                  |
| 630.0                   | 82.1                 | 81.9                 | 81.6                 | 81.4                  | 81.5                  | 81.5                  |
| 800.0                   | 84.4                 | 84.7                 | 83.4                 | 82.3                  | 82.2                  | 81.7                  |
| 1000.0                  | 86.9                 | 86.1                 | 84.6                 | 83.6                  | 82.5                  | 82.4                  |
| 1250.0                  | 89.3                 | 88.1                 | 86.7                 | 85.9                  | 85.0                  | 84.6                  |
| 1600.0                  | 90.6                 | 89.0                 | 87.6                 | 87.0                  | 85.9                  | 85.5                  |
| 2000.0                  | 91.8                 | 90.4                 | 89.1                 | 88.4                  | 87.1                  | 86.6                  |
| 2500.0                  | 92.2                 | 91.3                 | 89.8                 | 89.2                  | 88.4                  | 87.6                  |
| 3150.0                  | 93.3                 | 92.1                 | 90.7                 | 90.0                  | 89.1                  | 88.6                  |
| 4000.0                  | 93.8                 | 92.8                 | 91.5                 | 90.6                  | 89.8                  | 89.3                  |
| 5000.0                  | 93.8                 | 93.1                 | 91.9                 | 90.7                  | 90.1                  | 89.6                  |
| 6300.0                  | 94.3                 | 94.4                 | 92.5                 | 91.6                  | 90.8                  | 90.4                  |
| 8000.0                  | 94.5                 | 95.0                 | 91.7                 | 91.4                  | 90.6                  | 90.2                  |
| 10000.0                 | 95.0                 | 95.0                 | 91.9                 | 91.3                  | 90.7                  | 90.1                  |
| 12500.0                 | 95.3                 | 94.0                 | 92.2                 | 91.3                  | 90.7                  | 90.1                  |
| 16000.0                 | 93.8                 | 93.6                 | 90.7                 | 90.6                  | 90.0                  | 89.3                  |
| 20000.0                 | 92.1                 | 93.7                 | 90.6                 | 90.0                  | 89.1                  | 88.8                  |
| 25000.0                 | 92.2                 | 92.4                 | 90.0                 | 89.3                  | 88.7                  | 88.6                  |
| 31500.0                 | 91.7                 | 92.5                 | 89.6                 | 88.7                  | 88.2                  | 88.3                  |
| 40000.0                 | 90.4                 | 92.3                 | 89.2                 | 88.6                  | 87.3                  | 88.4                  |
| OVERALL<br>SPL          | 105.3                | 105.0                | 102.9                | 102.2                 | 101.4                 | 101.0                 |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 66.8                        | 66.2                        | 68.9                        | 68.7                        |
| 250.0                                  | 69.4                        | 68.9                        | 70.2                        | 70.3                        |
| 315.2                                  | 72.1                        | 70.8                        | 71.3                        | 72.4                        |
| 400.0                                  | 74.4                        | 73.0                        | 73.0                        | 74.0                        |
| 500.0                                  | 78.6                        | 76.8                        | 76.5                        | 75.6                        |
| 630.0                                  | 82.2                        | 81.3                        | 79.0                        | 75.7                        |
| 800.0                                  | 81.2                        | 80.4                        | 80.2                        | 78.3                        |
| 1000.0                                 | 81.6                        | 80.5                        | 80.6                        | 79.4                        |
| 1250.0                                 | 83.3                        | 82.9                        | 83.0                        | 80.7                        |
| 1600.0                                 | 84.3                        | 83.7                        | 83.3                        | 82.6                        |
| 2000.0                                 | 85.8                        | 85.7                        | 84.8                        | 83.2                        |
| 2500.0                                 | 87.0                        | 86.5                        | 85.8                        | 84.4                        |
| 3150.0                                 | 87.8                        | 87.4                        | 86.7                        | 85.4                        |
| 4000.0                                 | 88.8                        | 88.1                        | 87.7                        | 85.9                        |
| 5000.0                                 | 89.1                        | 88.2                        | 88.0                        | 86.4                        |
| 6300.0                                 | 90.0                        | 89.3                        | 88.9                        | 87.4                        |
| 8000.0                                 | 90.1                        | 89.7                        | 88.9                        | 87.4                        |
| 10000.0                                | 90.1                        | 89.6                        | 88.7                        | 86.9                        |
| 12500.0                                | 90.0                        | 89.5                        | 88.3                        | 86.4                        |
| 16000.0                                | 89.4                        | 88.6                        | 87.4                        | 84.8                        |
| 20000.0                                | 88.6                        | 87.6                        | 86.3                        | 83.3                        |
| 25000.0                                | 87.9                        | 86.8                        | 85.5                        | 82.0                        |
| 31500.0                                | 87.1                        | 86.1                        | 84.7                        | 80.7                        |
| 40000.0                                | 86.5                        | 85.9                        | 83.8                        | 79.5                        |
| OVERALL<br>SPL                         | 100.5                       | 99.9                        | 99.0                        | 97.1                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.67 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 519.00 DEG.F, CHAMBER TEMPERATURE = 80.00 DEG.F  
RELATIVE HUMIDITY = 52.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 27

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.047  
TEMPERATURE RATIO TR = 1.813  
MACH NUMBER MJ = 0.259  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.790  
JET DENSITY RATIO DJ/D0 = 0.559  
JET VELOCITY RATIO VJ/A0 = 0.347  
JET VELOCITY VJ = 395.5 FPS

TR/TJ = 1.013  
DR/D0 = 0.578  
DR/DJ = 1.034  
MASS FLOW = 0.355 POUNDS PER SECOND  
THRUST = 4.34 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 57.0  |       | 58.6  |       | 56.2  |       |
| 250.0   | 60.0  |       | 60.3  |       | 59.6  |       |
| 315.2   | 64.8  |       | 62.9  |       | 64.0  |       |
| 400.0   | 65.5  |       | 66.0  |       | 63.9  |       |
| 500.0   | 67.6  |       | 65.3  |       | 64.9  |       |
| 630.0   | 64.0  |       | 65.0  |       | 65.3  |       |
| 800.0   | 65.8  |       | 66.2  |       | 63.9  |       |
| 1000.0  | 63.9  |       | 64.9  |       | 65.7  |       |
| 1250.0  | 62.0  |       | 64.4  |       | 65.6  |       |
| 1600.0  | 58.9  |       | 62.6  |       | 63.9  |       |
| 2000.0  | 56.7  |       | 61.1  |       | 63.0  |       |
| 2500.0  | 53.8  |       | 58.6  |       | 60.8  |       |
| 3150.0  | 50.7  |       | 56.4  |       | 59.1  |       |
| 4000.0  | 51.6  |       | 55.7  |       | 57.3  |       |
| 5000.0  | 50.4  |       | 54.8  |       | 55.3  |       |
| 6300.0  | 50.1  |       | 53.3  |       | 53.5  |       |
| 8000.0  | 49.8  |       | 51.7  |       | 52.4  |       |
| 10000.0 | 49.9  |       | 50.6  |       | 51.7  |       |
| 12500.0 | 49.7  |       | 50.2  |       | 50.5  |       |
| 16000.0 | 48.1  |       | 50.1  |       | 49.8  |       |
| 20000.0 | 47.2  |       | 49.0  |       | 49.1  |       |
| 25000.0 | 47.9  |       | 50.1  |       | 49.3  |       |
| 31500.0 | 49.6  |       | 52.3  |       | 49.9  |       |
| 40000.0 | 52.2  |       | 55.6  |       | 51.7  |       |
|         |       |       |       |       | 52.1  |       |
|         |       |       |       |       | 57.2  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 74.3  |       | 74.9  |       | 75.1  |       |
|         |       |       |       |       | 73.5  |       |
|         |       |       |       |       | 74.2  |       |
|         |       |       |       |       |       | 73.1  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 51.5                                  | 53.1                                  | 51.0                                  | 51.0                                   | 52.5                                   | 52.1                                   |
| 250.0                                  | 53.8                                  | 53.0                                  | 52.4                                  | 51.6                                   | 51.8                                   | 51.3                                   |
| 315.2                                  | 57.6                                  | 57.0                                  | 55.9                                  | 55.2                                   | 54.8                                   | 55.0                                   |
| 400.0                                  | 59.0                                  | 58.0                                  | 56.4                                  | 56.1                                   | 55.5                                   | 55.0                                   |
| 500.0                                  | 59.8                                  | 58.7                                  | 57.8                                  | 57.2                                   | 56.9                                   | 56.0                                   |
| 630.0                                  | 60.8                                  | 59.7                                  | 59.0                                  | 58.1                                   | 57.8                                   | 57.0                                   |
| 800.0                                  | 61.0                                  | 60.8                                  | 59.3                                  | 58.8                                   | 58.6                                   | 57.6                                   |
| 1000.0                                 | 61.8                                  | 61.0                                  | 59.8                                  | 59.4                                   | 59.0                                   | 58.1                                   |
| 1250.0                                 | 61.6                                  | 61.4                                  | 60.2                                  | 59.6                                   | 59.6                                   | 58.9                                   |
| 1600.0                                 | 61.7                                  | 61.0                                  | 60.1                                  | 59.2                                   | 59.0                                   | 58.4                                   |
| 2000.0                                 | 61.4                                  | 60.8                                  | 60.0                                  | 59.3                                   | 59.1                                   | 58.5                                   |
| 2500.0                                 | 60.5                                  | 60.2                                  | 59.1                                  | 58.6                                   | 58.6                                   | 58.1                                   |
| 3150.0                                 | 59.9                                  | 59.5                                  | 58.6                                  | 58.3                                   | 58.2                                   | 57.6                                   |
| 4000.0                                 | 59.1                                  | 59.1                                  | 58.2                                  | 57.5                                   | 57.6                                   | 56.9                                   |
| 5000.0                                 | 58.7                                  | 58.4                                  | 57.3                                  | 57.1                                   | 57.1                                   | 56.8                                   |
| 6300.0                                 | 57.8                                  | 57.7                                  | 56.5                                  | 56.5                                   | 56.7                                   | 56.3                                   |
| 8000.0                                 | 57.0                                  | 57.0                                  | 55.7                                  | 55.6                                   | 56.1                                   | 55.6                                   |
| 10000.0                                | 57.0                                  | 56.3                                  | 55.0                                  | 55.0                                   | 55.6                                   | 55.5                                   |
| 12500.0                                | 55.9                                  | 55.8                                  | 54.6                                  | 54.5                                   | 55.1                                   | 55.1                                   |
| 16000.0                                | 55.3                                  | 55.3                                  | 54.6                                  | 54.1                                   | 55.0                                   | 54.9                                   |
| 20000.0                                | 54.9                                  | 54.8                                  | 54.1                                  | 53.3                                   | 54.3                                   | 54.0                                   |
| 25000.0                                | 54.5                                  | 54.4                                  | 54.0                                  | 53.0                                   | 54.1                                   | 53.4                                   |
| 31500.0                                | 54.8                                  | 54.1                                  | 53.8                                  | 53.0                                   | 54.3                                   | 53.1                                   |
| 40000.0                                | 57.8                                  | 54.4                                  | 54.1                                  | 53.6                                   | 55.6                                   | 53.4                                   |
| OVERALL<br>SPL                         | 72.7                                  | 72.1                                  | 71.1                                  | 70.6                                   | 70.7                                   | 70.0                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.67 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 495.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 213

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.047  
TEMPERATURE RATIO TR = 1.844  
MACH NUMBER MJ = 0.259  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.820  
JET DENSITY RATIO DJ/D0 = 0.549  
JET VELOCITY RATIO VJ/A0 = 0.350  
JET VELOCITY VJ = 390.6 FPS

TR/TJ = 1.013  
DR/D0 = 0.568  
DR/DJ = 1.034  
MASS FLOW = 0.352 POUNDS PER SECOND  
THRUST = 4.34 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 54.6                                   | 57.0                                   | 54.9                                   | 53.3                                    | 53.0                                    | 54.4                                    |
| 250.0                                  | 56.7                                   | 56.2                                   | 54.6                                   | 55.0                                    | 55.2                                    | 54.4                                    |
| 315.2                                  | 59.4                                   | 58.9                                   | 58.2                                   | 57.7                                    | 57.2                                    | 57.5                                    |
| 400.0                                  | 60.3                                   | 59.9                                   | 57.8                                   | 59.0                                    | 57.5                                    | 59.6                                    |
| 500.0                                  | 59.7                                   | 59.0                                   | 58.1                                   | 58.2                                    | 57.4                                    | 56.9                                    |
| 630.0                                  | 61.2                                   | 60.5                                   | 59.3                                   | 59.2                                    | 58.4                                    | 58.4                                    |
| 800.0                                  | 62.2                                   | 61.5                                   | 60.4                                   | 59.5                                    | 58.9                                    | 58.9                                    |
| 1000.0                                 | 62.0                                   | 60.7                                   | 60.1                                   | 59.7                                    | 58.6                                    | 58.3                                    |
| 1250.0                                 | 61.8                                   | 61.0                                   | 60.6                                   | 59.9                                    | 59.0                                    | 58.6                                    |
| 1600.0                                 | 61.3                                   | 60.8                                   | 59.8                                   | 59.6                                    | 59.5                                    | 58.4                                    |
| 2000.0                                 | 61.1                                   | 60.5                                   | 59.9                                   | 59.7                                    | 58.8                                    | 58.5                                    |
| 2500.0                                 | 60.7                                   | 59.7                                   | 59.3                                   | 59.1                                    | 58.5                                    | 58.2                                    |
| 3150.0                                 | 59.9                                   | 59.3                                   | 58.6                                   | 58.7                                    | 58.4                                    | 57.9                                    |
| 4000.0                                 | 59.4                                   | 58.9                                   | 58.3                                   | 58.1                                    | 57.6                                    | 57.0                                    |
| 5000.0                                 | 58.4                                   | 58.3                                   | 58.1                                   | 57.7                                    | 57.5                                    | 56.7                                    |
| 6300.0                                 | 58.1                                   | 58.3                                   | 57.5                                   | 57.5                                    | 57.3                                    | 56.9                                    |
| 8000.0                                 | 57.6                                   | 58.2                                   | 55.8                                   | 56.4                                    | 56.5                                    | 56.2                                    |
| 10000.0                                | 57.7                                   | 57.6                                   | 55.6                                   | 55.6                                    | 56.1                                    | 55.6                                    |
| 12500.0                                | 57.7                                   | 56.3                                   | 55.6                                   | 55.4                                    | 55.4                                    | 55.1                                    |
| 16000.0                                | 56.7                                   | 56.5                                   | 54.5                                   | 54.8                                    | 55.3                                    | 54.6                                    |
| 20000.0                                | 56.0                                   | 56.8                                   | 54.9                                   | 54.5                                    | 55.1                                    | 54.3                                    |
| 25000.0                                | 55.8                                   | 55.1                                   | 54.3                                   | 54.0                                    | 54.2                                    | 53.7                                    |
| 31500.0                                | 56.0                                   | 55.5                                   | 54.3                                   | 54.0                                    | 54.3                                    | 53.7                                    |
| 40000.0                                | 55.2                                   | 55.6                                   | 54.2                                   | 54.8                                    | 54.3                                    | 54.5                                    |
| OVERALL<br>SPL                         | 73.1                                   | 72.6                                   | 71.6                                   | 71.4                                    | 71.0                                    | 70.8                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 54.6                        | 56.7                        | 53.9                        | 55.6                        |
| 250.0                                  | 54.7                        | 54.6                        | 55.2                        | 53.6                        |
| 315.2                                  | 57.7                        | 57.1                        | 55.6                        | 56.2                        |
| 400.0                                  | 58.2                        | 57.8                        | 56.8                        | 60.1                        |
| 500.0                                  | 56.9                        | 56.1                        | 56.1                        | 55.8                        |
| 630.0                                  | 57.8                        | 56.9                        | 56.4                        | 55.7                        |
| 800.0                                  | 58.6                        | 58.1                        | 56.8                        | 56.1                        |
| 1000.0                                 | 58.6                        | 57.2                        | 56.2                        | 55.5                        |
| 1250.0                                 | 58.1                        | 56.9                        | 56.3                        | 54.5                        |
| 1600.0                                 | 58.0                        | 56.6                        | 55.4                        | 53.9                        |
| 2000.0                                 | 58.2                        | 56.7                        | 55.1                        | 53.3                        |
| 2500.0                                 | 58.2                        | 56.7                        | 54.9                        | 52.8                        |
| 3150.0                                 | 57.7                        | 56.4                        | 54.9                        | 52.3                        |
| 4000.0                                 | 57.3                        | 56.0                        | 54.5                        | 51.7                        |
| 5000.0                                 | 56.8                        | 55.2                        | 53.6                        | 50.7                        |
| 6300.0                                 | 56.6                        | 54.8                        | 53.3                        | 50.4                        |
| 8000.0                                 | 56.0                        | 54.2                        | 52.4                        | 49.6                        |
| 10000.0                                | 55.4                        | 53.0                        | 51.4                        | 48.6                        |
| 12500.0                                | 54.9                        | 52.4                        | 50.4                        | 48.0                        |
| 16000.0                                | 54.5                        | 51.8                        | 50.1                        | 47.1                        |
| 20000.0                                | 54.4                        | 51.3                        | 49.7                        | 46.9                        |
| 25000.0                                | 53.1                        | 49.9                        | 47.6                        | 44.0                        |
| 31500.0                                | 52.6                        | 49.3                        | 46.5                        | 43.1                        |
| 40000.0                                | 52.3                        | 49.3                        | 45.9                        | 44.5                        |
| OVERALL<br>SPL                         | 70.5                        | 69.3                        | 68.0                        | 67.3                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.88 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 524.00 DEG.F, CHAMBER TEMPERATURE = 88.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 41

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.062$   
TEMPERATURE RATIO  $TR = 1.796$   
MACH NUMBER  $MJ = 0.296$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.766$   
JET DENSITY RATIO  $DJ/D0 = 0.566$   
JET VELOCITY RATIO  $VJ/A0 = 0.394$   
JET VELOCITY  $VJ = 452.0$  FPS

$TR/TJ = 1.017$   
 $DR/D0 = 0.591$   
 $DR/DJ = 1.045$   
MASS FLOW = 0.408 POUNDS PER SECOND  
THRUST = 5.66 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO | MICRO | MICRO | MICRO | MICRO | MICRO |
| CENTER  | PHONE | PHONE | PHONE | PHONE | PHONE | PHONE |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| MZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 62.4  | 0.0   | 58.7  | 57.0  | 56.7  | 55.4  |
| 250.0   | 63.3  | 0.0   | 62.8  | 60.1  | 59.9  | 57.8  |
| 315.2   | 67.0  | 0.0   | 66.0  | 63.0  | 62.9  | 60.2  |
| 400.0   | 69.4  | 0.0   | 67.0  | 64.9  | 64.6  | 62.4  |
| 500.0   | 72.1  | 0.0   | 68.7  | 66.4  | 66.3  | 64.1  |
| 630.0   | 69.0  | 0.0   | 69.8  | 67.2  | 67.0  | 65.5  |
| 800.0   | 71.0  | 0.0   | 70.1  | 68.2  | 67.9  | 66.2  |
| 1000.0  | 68.1  | 0.0   | 70.1  | 68.3  | 68.1  | 67.1  |
| 1250.0  | 67.0  | 0.0   | 70.1  | 68.5  | 68.6  | 67.2  |
| 1600.0  | 64.2  | 0.0   | 68.6  | 67.4  | 67.7  | 67.0  |
| 2000.0  | 61.2  | 0.0   | 67.4  | 66.7  | 67.6  | 66.7  |
| 2500.0  | 59.0  | 0.0   | 65.6  | 65.3  | 66.5  | 65.9  |
| 3150.0  | 55.7  | 0.0   | 63.6  | 63.8  | 65.5  | 65.0  |
| 4000.0  | 56.6  | 0.0   | 62.1  | 62.7  | 65.3  | 64.2  |
| 5000.0  | 55.1  | 0.0   | 60.0  | 60.7  | 63.8  | 63.5  |
| 6300.0  | 54.5  | 0.0   | 58.3  | 59.2  | 62.8  | 62.6  |
| 8000.0  | 54.3  | 0.0   | 57.0  | 57.8  | 61.2  | 61.4  |
| 10000.0 | 54.5  | 0.0   | 55.8  | 56.9  | 60.5  | 61.0  |
| 12500.0 | 54.5  | 0.0   | 54.4  | 55.9  | 59.9  | 60.6  |
| 16000.0 | 52.6  | 0.0   | 53.7  | 55.1  | 59.4  | 60.1  |
| 20000.0 | 50.7  | 0.0   | 52.5  | 54.0  | 58.1  | 59.3  |
| 25000.0 | 51.0  | 0.0   | 52.4  | 53.4  | 57.7  | 58.9  |
| 31500.0 | 52.1  | 0.0   | 51.9  | 52.5  | 57.0  | 58.1  |
| 40000.0 | 54.9  | 0.0   | 52.8  | 53.5  | 57.5  | 57.7  |
| OVERALL |       |       |       |       |       |       |
| SPL     | 78.7  | 116.6 | 79.2  | 77.7  | 78.4  | 77.4  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 7 60.0                      | 8 67.5                      | 9 75.0                      | 10 82.5                     | 11 90.0                     | 12 97.5                     |
| 200.0                                  | 54.3                        | 54.1                        | 53.1                        | 52.8                        | 53.9                        | 54.0                        |
| 250.0                                  | 56.2                        | 55.3                        | 54.8                        | 54.0                        | 54.3                        | 53.8                        |
| 315.2                                  | 58.6                        | 57.5                        | 57.0                        | 56.9                        | 55.8                        | 56.1                        |
| 400.0                                  | 61.4                        | 60.0                        | 59.2                        | 58.0                        | 57.5                        | 56.8                        |
| 500.0                                  | 62.7                        | 61.5                        | 60.9                        | 60.1                        | 59.4                        | 58.8                        |
| 630.0                                  | 64.1                        | 62.5                        | 62.1                        | 61.5                        | 60.7                        | 60.5                        |
| 800.0                                  | 65.2                        | 63.9                        | 62.8                        | 61.9                        | 61.3                        | 61.0                        |
| 1000.0                                 | 65.8                        | 64.4                        | 63.5                        | 63.0                        | 62.5                        | 61.7                        |
| 1250.0                                 | 65.9                        | 65.2                        | 64.1                        | 63.6                        | 63.3                        | 62.7                        |
| 1600.0                                 | 66.1                        | 65.0                        | 63.9                        | 63.5                        | 63.3                        | 62.4                        |
| 2000.0                                 | 66.0                        | 65.1                        | 63.9                        | 63.5                        | 63.4                        | 62.4                        |
| 2500.0                                 | 65.3                        | 64.6                        | 63.6                        | 63.1                        | 63.0                        | 62.1                        |
| 3150.0                                 | 64.6                        | 63.9                        | 63.2                        | 63.0                        | 62.6                        | 62.0                        |
| 4000.0                                 | 64.2                        | 63.7                        | 62.8                        | 62.5                        | 62.2                        | 61.7                        |
| 5000.0                                 | 63.5                        | 63.0                        | 61.7                        | 61.7                        | 61.6                        | 61.1                        |
| 6300.0                                 | 62.8                        | 62.5                        | 60.9                        | 61.2                        | 61.1                        | 60.9                        |
| 8000.0                                 | 61.8                        | 61.5                        | 60.3                        | 60.2                        | 60.3                        | 60.3                        |
| 10000.0                                | 61.3                        | 61.1                        | 59.8                        | 59.9                        | 60.0                        | 60.2                        |
| 12500.0                                | 60.7                        | 60.6                        | 59.3                        | 59.4                        | 59.4                        | 59.7                        |
| 16000.0                                | 60.3                        | 60.5                        | 59.5                        | 58.8                        | 59.3                        | 59.5                        |
| 20000.0                                | 59.5                        | 59.5                        | 58.9                        | 57.8                        | 58.2                        | 58.4                        |
| 25000.0                                | 59.0                        | 58.8                        | 58.6                        | 57.2                        | 57.6                        | 57.8                        |
| 31500.0                                | 58.1                        | 57.9                        | 58.0                        | 56.1                        | 56.6                        | 56.6                        |
| 40000.0                                | 58.6                        | 57.7                        | 57.6                        | 55.7                        | 57.1                        | 56.0                        |
| OVERALL<br>SPL                         | 76.8                        | 76.0                        | 75.0                        | 74.5                        | 74.4                        | 73.9                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.88 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 500.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 214

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.062$   
TEMPERATURE RATIO  $TR = 1.853$   
MACH NUMBER  $MJ = 0.297$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.823$   
JET DENSITY RATIO  $DJ/D0 = 0.549$   
JET VELOCITY RATIO  $VJ/A0 = 0.400$   
JET VELOCITY  $VJ = 446.8$  FPS

$TR/TJ = 1.017$   
 $DR/D0 = 0.573$   
 $DR/DJ = 1.045$   
MASS FLOW = 0.402 POUNDS PER SECOND  
THRUST = 5.67 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 56.3                                   | 57.2                                   | 56.6                                   | 54.4                                    | 55.4                                    | 55.6                                    |
| 250.0                                  | 57.5                                   | 57.6                                   | 56.7                                   | 55.9                                    | 56.7                                    | 56.4                                    |
| 315.2                                  | 59.7                                   | 59.6                                   | 59.3                                   | 59.4                                    | 59.0                                    | 58.6                                    |
| 400.0                                  | 61.4                                   | 61.5                                   | 60.0                                   | 60.6                                    | 59.5                                    | 60.7                                    |
| 500.0                                  | 62.1                                   | 61.3                                   | 61.5                                   | 60.9                                    | 60.3                                    | 59.9                                    |
| 630.0                                  | 64.2                                   | 63.4                                   | 62.6                                   | 62.0                                    | 61.5                                    | 61.7                                    |
| 800.0                                  | 65.5                                   | 64.2                                   | 63.2                                   | 62.8                                    | 62.3                                    | 62.0                                    |
| 1000.0                                 | 65.1                                   | 64.0                                   | 63.9                                   | 63.2                                    | 62.3                                    | 62.1                                    |
| 1250.0                                 | 65.2                                   | 64.2                                   | 64.3                                   | 64.0                                    | 62.9                                    | 62.6                                    |
| 1600.0                                 | 64.7                                   | 63.8                                   | 64.1                                   | 63.5                                    | 63.0                                    | 62.6                                    |
| 2000.0                                 | 64.8                                   | 64.4                                   | 64.7                                   | 63.8                                    | 62.9                                    | 63.1                                    |
| 2500.0                                 | 64.4                                   | 63.7                                   | 64.0                                   | 63.4                                    | 62.7                                    | 62.8                                    |
| 3150.0                                 | 63.8                                   | 63.1                                   | 63.6                                   | 63.2                                    | 62.1                                    | 62.3                                    |
| 4000.0                                 | 63.2                                   | 63.1                                   | 63.2                                   | 62.7                                    | 61.8                                    | 61.8                                    |
| 5000.0                                 | 62.3                                   | 62.3                                   | 62.8                                   | 62.0                                    | 61.4                                    | 61.3                                    |
| 6300.0                                 | 61.6                                   | 62.3                                   | 62.3                                   | 61.7                                    | 61.4                                    | 61.5                                    |
| 8000.0                                 | 61.3                                   | 62.1                                   | 60.6                                   | 60.8                                    | 60.3                                    | 60.6                                    |
| 10000.0                                | 61.4                                   | 61.3                                   | 60.2                                   | 60.1                                    | 59.8                                    | 60.1                                    |
| 12500.0                                | 61.3                                   | 59.8                                   | 60.3                                   | 59.7                                    | 59.5                                    | 59.6                                    |
| 16000.0                                | 59.8                                   | 59.9                                   | 59.1                                   | 59.2                                    | 59.0                                    | 58.9                                    |
| 20000.0                                | 58.7                                   | 60.0                                   | 59.3                                   | 58.7                                    | 58.4                                    | 58.5                                    |
| 25000.0                                | 59.1                                   | 58.6                                   | 58.8                                   | 58.3                                    | 57.7                                    | 58.2                                    |
| 31500.0                                | 59.3                                   | 59.1                                   | 58.9                                   | 58.2                                    | 57.7                                    | 58.5                                    |
| 40000.0                                | 58.6                                   | 59.3                                   | 59.2                                   | 58.7                                    | 57.4                                    | 59.2                                    |
| OVERALL<br>SPL                         | 76.3                                   | 75.8                                   | 75.6                                   | 75.1                                    | 74.5                                    | 74.6                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 55.7  |       | 57.2  |       | 55.5  |       | 56.5  |  |
| 250.0   |       | 56.2  |       | 55.3  |       | 55.2  |       | 54.6  |  |
| 315.2   |       | 58.3  |       | 57.8  |       | 56.6  |       | 56.3  |  |
| 400.0   |       | 59.7  |       | 59.8  |       | 59.3  |       | 61.5  |  |
| 500.0   |       | 59.3  |       | 58.7  |       | 58.4  |       | 57.5  |  |
| 630.0   |       | 61.3  |       | 59.8  |       | 58.7  |       | 57.7  |  |
| 800.0   |       | 61.9  |       | 60.5  |       | 59.0  |       | 58.5  |  |
| 1000.0  |       | 62.3  |       | 60.5  |       | 59.3  |       | 58.3  |  |
| 1250.0  |       | 62.1  |       | 60.3  |       | 59.3  |       | 57.6  |  |
| 1600.0  |       | 61.9  |       | 59.8  |       | 58.6  |       | 56.8  |  |
| 2000.0  |       | 62.2  |       | 60.4  |       | 59.2  |       | 56.7  |  |
| 2500.0  |       | 62.0  |       | 60.3  |       | 58.6  |       | 56.2  |  |
| 3150.0  |       | 62.2  |       | 60.1  |       | 58.4  |       | 55.7  |  |
| 4000.0  |       | 61.8  |       | 60.0  |       | 58.2  |       | 54.7  |  |
| 5000.0  |       | 61.1  |       | 59.1  |       | 57.1  |       | 53.7  |  |
| 6300.0  |       | 60.8  |       | 58.8  |       | 56.7  |       | 53.7  |  |
| 8000.0  |       | 60.1  |       | 58.2  |       | 55.6  |       | 52.7  |  |
| 10000.0 |       | 59.7  |       | 57.3  |       | 54.7  |       | 51.6  |  |
| 12500.0 |       | 59.1  |       | 56.5  |       | 53.8  |       | 50.8  |  |
| 16000.0 |       | 58.6  |       | 56.0  |       | 53.4  |       | 49.9  |  |
| 20000.0 |       | 58.0  |       | 55.0  |       | 53.0  |       | 49.3  |  |
| 25000.0 |       | 57.2  |       | 53.8  |       | 51.4  |       | 46.9  |  |
| 31500.0 |       | 56.8  |       | 53.4  |       | 50.6  |       | 45.7  |  |
| 40000.0 |       | 56.6  |       | 53.2  |       | 49.6  |       | 45.9  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 74.1  |       | 72.3  |       | 70.9  |       | 69.5  |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.39 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 533.00 DEG.F, CHAMBER TEMPERATURE = 88.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 42

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.098$   
TEMPERATURE RATIO  $T_r = 1.812$   
MACH NUMBER  $M_J = 0.370$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.766$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.566$   
JET VELOCITY RATIO  $V_J/A_0 = 0.492$   
JET VELOCITY  $V_J = 564.6$  FPS

$T_r/T_J = 1.026$   
 $D_r/D_0 = 0.506$   
 $D_r/D_J = 1.070$   
MASS FLOW = 0.610 POUNDS PER SECOND  
THRUST = 8.84 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 66.9  |       | 66.4  |       | 63.3  |       |
| 250.0   | 68.9  |       | 69.5  |       | 67.3  |       |
| 315.2   | 71.7  |       | 71.4  |       | 72.0  |       |
| 400.0   | 73.7  |       | 75.6  |       | 72.9  |       |
| 500.0   | 77.4  |       | 76.0  |       | 75.0  |       |
| 630.0   | 75.3  |       | 76.8  |       | 76.4  |       |
| 800.0   | 77.8  |       | 78.6  |       | 77.3  |       |
| 1000.0  | 76.0  |       | 77.3  |       | 77.4  |       |
| 1250.0  | 74.3  |       | 76.8  |       | 77.6  |       |
| 1600.0  | 71.5  |       | 74.8  |       | 75.6  |       |
| 2000.0  | 69.6  |       | 73.0  |       | 74.7  |       |
| 2500.0  | 66.7  |       | 70.6  |       | 73.2  |       |
| 3150.0  | 64.5  |       | 68.4  |       | 71.4  |       |
| 4000.0  | 64.2  |       | 67.6  |       | 69.9  |       |
| 5000.0  | 62.7  |       | 65.9  |       | 67.9  |       |
| 6300.0  | 62.1  |       | 64.2  |       | 65.9  |       |
| 8000.0  | 61.2  |       | 62.4  |       | 64.1  |       |
| 10000.0 | 61.3  |       | 60.2  |       | 63.1  |       |
| 12500.0 | 61.4  |       | 59.5  |       | 61.5  |       |
| 16000.0 | 59.5  |       | 59.4  |       | 60.5  |       |
| 20000.0 | 57.3  |       | 57.4  |       | 58.8  |       |
| 25000.0 | 57.1  |       | 57.4  |       | 58.1  |       |
| 31500.0 | 57.7  |       | 58.0  |       | 56.8  |       |
| 40000.0 | 60.5  |       | 60.4  |       | 56.4  |       |
|         |       |       |       |       | 57.3  |       |
|         |       |       |       |       | 61.6  |       |
|         |       |       |       |       | 61.2  |       |
|         |       |       |       |       | 63.7  |       |
|         |       |       |       |       | 67.4  |       |
|         |       |       |       |       | 69.7  |       |
|         |       |       |       |       | 71.6  |       |
|         |       |       |       |       | 72.6  |       |
|         |       |       |       |       | 74.3  |       |
|         |       |       |       |       | 75.0  |       |
|         |       |       |       |       | 75.7  |       |
|         |       |       |       |       | 75.0  |       |
|         |       |       |       |       | 74.6  |       |
|         |       |       |       |       | 74.4  |       |
|         |       |       |       |       | 74.2  |       |
|         |       |       |       |       | 73.3  |       |
|         |       |       |       |       | 72.9  |       |
|         |       |       |       |       | 71.5  |       |
|         |       |       |       |       | 70.7  |       |
|         |       |       |       |       | 69.0  |       |
|         |       |       |       |       | 68.0  |       |
|         |       |       |       |       | 67.0  |       |
|         |       |       |       |       | 65.9  |       |
|         |       |       |       |       | 64.5  |       |
|         |       |       |       |       | 63.6  |       |
|         |       |       |       |       | 62.3  |       |
|         |       |       |       |       | 61.6  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 84.9  |       | 86.2  |       | 84.8  |       |
|         |       |       |       |       | 85.3  |       |
|         |       |       |       |       | 84.2  |       |

# 1/3 OCTAVE SOUND PRESSURE LEVEL CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 57.4                                  | 57.8                                  | 56.6                                  | 56.1                                   | 57.0                                   | 56.9                                   |
| 250.0                                  | 59.8                                  | 59.0                                  | 58.0                                  | 57.2                                   | 58.0                                   | 57.0                                   |
| 315.2                                  | 63.2                                  | 61.8                                  | 61.3                                  | 60.3                                   | 60.2                                   | 59.9                                   |
| 400.0                                  | 65.9                                  | 63.8                                  | 62.5                                  | 61.9                                   | 61.7                                   | 60.7                                   |
| 500.0                                  | 67.8                                  | 66.2                                  | 65.0                                  | 64.0                                   | 63.8                                   | 62.7                                   |
| 630.0                                  | 69.3                                  | 67.9                                  | 66.5                                  | 66.1                                   | 66.0                                   | 64.8                                   |
| 800.0                                  | 70.6                                  | 69.0                                  | 68.1                                  | 67.2                                   | 67.1                                   | 66.0                                   |
| 1000.0                                 | 71.6                                  | 70.2                                  | 69.4                                  | 68.4                                   | 68.2                                   | 66.9                                   |
| 1250.0                                 | 72.5                                  | 71.6                                  | 70.2                                  | 69.6                                   | 69.0                                   | 68.4                                   |
| 1600.0                                 | 72.5                                  | 71.5                                  | 70.3                                  | 69.6                                   | 69.7                                   | 68.5                                   |
| 2000.0                                 | 72.8                                  | 71.9                                  | 70.6                                  | 69.9                                   | 69.9                                   | 68.8                                   |
| 2500.0                                 | 72.3                                  | 71.5                                  | 70.2                                  | 69.8                                   | 69.8                                   | 68.8                                   |
| 3150.0                                 | 71.9                                  | 71.1                                  | 70.1                                  | 69.9                                   | 69.7                                   | 68.8                                   |
| 4000.0                                 | 71.5                                  | 71.1                                  | 70.4                                  | 69.7                                   | 69.7                                   | 68.7                                   |
| 5000.0                                 | 70.9                                  | 70.5                                  | 69.4                                  | 69.1                                   | 69.1                                   | 68.4                                   |
| 6300.0                                 | 70.4                                  | 70.0                                  | 68.7                                  | 68.7                                   | 68.7                                   | 68.1                                   |
| 8000.0                                 | 69.2                                  | 69.1                                  | 67.9                                  | 67.5                                   | 67.8                                   | 67.4                                   |
| 10000.0                                | 68.7                                  | 68.5                                  | 67.1                                  | 66.9                                   | 67.2                                   | 67.2                                   |
| 12500.0                                | 68.0                                  | 67.8                                  | 66.6                                  | 66.3                                   | 66.5                                   | 66.7                                   |
| 16000.0                                | 67.3                                  | 67.4                                  | 66.4                                  | 65.6                                   | 66.1                                   | 66.4                                   |
| 20000.0                                | 66.4                                  | 66.3                                  | 65.5                                  | 64.5                                   | 64.9                                   | 65.0                                   |
| 25000.0                                | 65.8                                  | 65.4                                  | 65.0                                  | 63.8                                   | 64.1                                   | 64.0                                   |
| 31500.0                                | 64.7                                  | 64.2                                  | 64.1                                  | 62.3                                   | 62.9                                   | 62.5                                   |
| 40000.0                                | 64.4                                  | 63.7                                  | 63.4                                  | 61.3                                   | 62.4                                   | 61.5                                   |
| OVERALL<br>SPL                         | 83.3                                  | 82.5                                  | 81.4                                  | 80.8                                   | 80.9                                   | 80.1                                   |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.39 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 510.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 215

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.098$   
TEMPERATURE RATIO  $TR = 1.873$   
MACH NUMBER  $MJ = 0.371$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.825$   
JET DENSITY RATIO  $DJ/D0 = 0.548$   
JET VELOCITY RATIO  $VJ/A0 = 0.501$   
JET VELOCITY  $VJ = 558.4$  FPS

$TR/TJ = 1.026$   
 $DR/D0 = 0.586$   
 $DR/DJ = 1.070$   
MASS FLOW = 0.502 POUNDS PER SECOND  
THRUST = 8.85 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 56.8                                   | 58.7                                   | 58.5                                   | 57.5                                    | 57.2                                    | 57.3                                    |
| 250.0                                  | 59.4                                   | 59.6                                   | 58.2                                   | 58.5                                    | 60.0                                    | 58.6                                    |
| 315.2                                  | 61.8                                   | 62.3                                   | 61.8                                   | 60.9                                    | 61.5                                    | 61.6                                    |
| 400.0                                  | 64.2                                   | 64.1                                   | 63.3                                   | 63.6                                    | 62.5                                    | 63.1                                    |
| 500.0                                  | 66.7                                   | 65.6                                   | 64.9                                   | 65.3                                    | 64.1                                    | 63.8                                    |
| 630.0                                  | 68.6                                   | 68.0                                   | 66.3                                   | 65.9                                    | 65.9                                    | 65.8                                    |
| 800.0                                  | 70.8                                   | 69.2                                   | 67.8                                   | 67.0                                    | 67.6                                    | 66.6                                    |
| 1000.0                                 | 70.9                                   | 69.4                                   | 68.4                                   | 68.1                                    | 67.6                                    | 66.6                                    |
| 1250.0                                 | 72.0                                   | 70.3                                   | 69.9                                   | 69.2                                    | 68.8                                    | 68.1                                    |
| 1600.0                                 | 71.7                                   | 70.8                                   | 69.6                                   | 69.3                                    | 69.0                                    | 68.2                                    |
| 2000.0                                 | 71.5                                   | 71.0                                   | 70.0                                   | 69.6                                    | 69.1                                    | 68.6                                    |
| 2500.0                                 | 72.0                                   | 71.2                                   | 69.9                                   | 69.5                                    | 69.6                                    | 68.7                                    |
| 3150.0                                 | 71.8                                   | 70.6                                   | 69.8                                   | 69.6                                    | 69.0                                    | 68.7                                    |
| 4000.0                                 | 71.2                                   | 70.5                                   | 69.8                                   | 69.4                                    | 68.9                                    | 68.5                                    |
| 5000.0                                 | 70.2                                   | 70.1                                   | 69.4                                   | 68.9                                    | 68.7                                    | 67.9                                    |
| 6300.0                                 | 69.8                                   | 70.2                                   | 68.8                                   | 68.5                                    | 68.4                                    | 68.0                                    |
| 8000.0                                 | 69.3                                   | 70.1                                   | 67.2                                   | 67.7                                    | 67.6                                    | 66.9                                    |
| 10000.0                                | 69.3                                   | 69.3                                   | 66.8                                   | 66.8                                    | 66.9                                    | 66.2                                    |
| 12500.0                                | 69.1                                   | 67.6                                   | 66.7                                   | 66.4                                    | 66.5                                    | 65.9                                    |
| 16000.0                                | 67.6                                   | 67.3                                   | 65.3                                   | 65.8                                    | 65.7                                    | 65.3                                    |
| 20000.0                                | 65.9                                   | 67.2                                   | 65.3                                   | 65.3                                    | 65.1                                    | 64.6                                    |
| 25000.0                                | 66.4                                   | 65.9                                   | 64.8                                   | 64.8                                    | 64.6                                    | 64.2                                    |
| 31500.0                                | 66.6                                   | 66.4                                   | 64.8                                   | 64.9                                    | 64.4                                    | 64.4                                    |
| 40000.0                                | 66.0                                   | 66.5                                   | 65.0                                   | 65.4                                    | 64.1                                    | 65.0                                    |
| OVERALL<br>SPL                         | 83.0                                   | 82.4                                   | 81.1                                   | 80.9                                    | 80.6                                    | 80.1                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 56.5                                    | 58.0                                    | 56.7                                    | 58.1                                    |
| 250.0                                  | 58.8                                    | 58.3                                    | 57.7                                    | 57.7                                    |
| 315.2                                  | 61.2                                    | 59.8                                    | 59.0                                    | 59.4                                    |
| 400.0                                  | 62.7                                    | 61.8                                    | 62.2                                    | 61.9                                    |
| 500.0                                  | 63.3                                    | 62.5                                    | 62.4                                    | 61.4                                    |
| 630.0                                  | 65.7                                    | 64.8                                    | 63.2                                    | 62.4                                    |
| 800.0                                  | 66.4                                    | 65.2                                    | 64.2                                    | 63.0                                    |
| 1000.0                                 | 66.6                                    | 65.4                                    | 64.3                                    | 63.7                                    |
| 1250.0                                 | 67.7                                    | 66.0                                    | 64.7                                    | 63.0                                    |
| 1600.0                                 | 67.7                                    | 65.8                                    | 64.3                                    | 62.7                                    |
| 2000.0                                 | 68.2                                    | 66.7                                    | 64.8                                    | 62.8                                    |
| 2500.0                                 | 68.5                                    | 66.7                                    | 64.8                                    | 62.7                                    |
| 3150.0                                 | 68.4                                    | 66.5                                    | 64.9                                    | 62.3                                    |
| 4000.0                                 | 68.3                                    | 66.4                                    | 64.9                                    | 61.8                                    |
| 5000.0                                 | 67.9                                    | 65.6                                    | 64.1                                    | 60.9                                    |
| 6300.0                                 | 67.6                                    | 65.8                                    | 63.3                                    | 61.3                                    |
| 8000.0                                 | 66.9                                    | 65.0                                    | 62.5                                    | 59.8                                    |
| 10000.0                                | 66.1                                    | 63.9                                    | 61.6                                    | 58.8                                    |
| 12500.0                                | 65.5                                    | 63.3                                    | 60.5                                    | 58.2                                    |
| 16000.0                                | 65.0                                    | 62.6                                    | 59.9                                    | 56.8                                    |
| 20000.0                                | 64.2                                    | 61.7                                    | 58.9                                    | 55.7                                    |
| 25000.0                                | 63.5                                    | 60.9                                    | 58.1                                    | 54.4                                    |
| 31500.0                                | 63.1                                    | 60.4                                    | 57.7                                    | 53.4                                    |
| 40000.0                                | 63.2                                    | 60.5                                    | 57.1                                    | 52.7                                    |
| OVERALL<br>SPL                         | 79.8                                    | 78.0                                    | 76.3                                    | 74.5                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.04 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 544.00 DEG.F, CHAMBER TEMPERATURE = 88.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 43

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.144$   
TEMPERATURE RATIO  $TR = 1.832$   
MACH NUMBER  $MJ = 0.445$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.766$   
JET DENSITY RATIO  $DJ/DO = 0.566$   
JET VELOCITY RATIO  $VJ/AO = 0.592$   
JET VELOCITY  $VJ = 678.8$  FPS

$TR/TJ = 1.038$   
 $DR/DO = 0.624$   
 $DR/DJ = 1.102$   
MASS FLOW = 0.613 POUNDS PER SECOND  
THRUST = 12.77 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 70.7                                  | 71.7                                  | 68.3                                  | 65.5                                  | 65.0                                  | 62.3                                  |
| 250.0                                  | 73.6                                  | 73.7                                  | 71.9                                  | 69.0                                  | 67.5                                  | 65.7                                  |
| 315.2                                  | 78.1                                  | 75.6                                  | 76.1                                  | 72.2                                  | 71.0                                  | 68.5                                  |
| 400.0                                  | 79.8                                  | 80.5                                  | 77.8                                  | 75.2                                  | 73.4                                  | 71.4                                  |
| 500.0                                  | 82.8                                  | 80.8                                  | 80.2                                  | 77.4                                  | 75.6                                  | 73.2                                  |
| 630.0                                  | 81.8                                  | 82.1                                  | 82.2                                  | 79.3                                  | 78.0                                  | 75.5                                  |
| 800.0                                  | 84.4                                  | 84.5                                  | 83.2                                  | 80.9                                  | 79.0                                  | 77.1                                  |
| 1000.0                                 | 82.6                                  | 83.4                                  | 83.5                                  | 81.4                                  | 80.1                                  | 78.2                                  |
| 1250.0                                 | 80.5                                  | 83.0                                  | 83.4                                  | 82.0                                  | 80.9                                  | 78.8                                  |
| 1600.0                                 | 77.6                                  | 80.7                                  | 81.7                                  | 81.4                                  | 80.6                                  | 79.4                                  |
| 2000.0                                 | 75.4                                  | 78.8                                  | 80.6                                  | 80.8                                  | 80.7                                  | 79.8                                  |
| 2500.0                                 | 73.1                                  | 76.8                                  | 78.6                                  | 79.4                                  | 80.1                                  | 79.1                                  |
| 3150.0                                 | 70.3                                  | 74.8                                  | 76.4                                  | 78.3                                  | 79.5                                  | 78.7                                  |
| 4000.0                                 | 70.0                                  | 74.0                                  | 75.4                                  | 77.0                                  | 79.1                                  | 78.4                                  |
| 5000.0                                 | 68.1                                  | 72.3                                  | 73.4                                  | 74.9                                  | 77.8                                  | 77.5                                  |
| 6300.0                                 | 67.7                                  | 70.8                                  | 71.2                                  | 73.7                                  | 76.8                                  | 76.7                                  |
| 8000.0                                 | 66.9                                  | 69.2                                  | 69.7                                  | 72.0                                  | 75.2                                  | 75.4                                  |
| 10000.0                                | 67.0                                  | 67.1                                  | 68.0                                  | 70.6                                  | 74.1                                  | 74.7                                  |
| 12500.0                                | 67.0                                  | 66.0                                  | 66.6                                  | 69.3                                  | 72.9                                  | 73.7                                  |
| 16000.0                                | 65.1                                  | 65.4                                  | 65.4                                  | 68.2                                  | 71.9                                  | 72.8                                  |
| 20000.0                                | 62.5                                  | 63.4                                  | 63.7                                  | 66.6                                  | 70.4                                  | 71.5                                  |
| 25000.0                                | 61.2                                  | 63.3                                  | 62.8                                  | 65.5                                  | 69.3                                  | 70.6                                  |
| 31500.0                                | 60.4                                  | 64.1                                  | 61.6                                  | 64.0                                  | 67.9                                  | 69.5                                  |
| 40000.0                                | 61.0                                  | 66.2                                  | 61.4                                  | 63.5                                  | 67.2                                  | 68.8                                  |
| OVERALL<br>SPL                         | 91.1                                  | 91.8                                  | 91.8                                  | 90.8                                  | 90.7                                  | 89.7                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  |
|         | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
| 200.0   | 59.5  |       | 60.2  |       | 59.0  |       |
| 250.0   | 63.5  |       | 62.1  |       | 60.6  |       |
| 315.2   | 65.9  |       | 64.8  |       | 63.4  |       |
| 400.0   | 68.9  |       | 67.4  |       | 65.8  |       |
| 500.0   | 70.4  |       | 69.5  |       | 68.3  |       |
| 630.0   | 73.0  |       | 71.2  |       | 70.1  |       |
| 800.0   | 74.6  |       | 73.5  |       | 71.8  |       |
| 1000.0  | 75.9  |       | 74.7  |       | 73.3  |       |
| 1250.0  | 76.7  |       | 76.1  |       | 74.8  |       |
| 1600.0  | 77.3  |       | 76.3  |       | 75.3  |       |
| 2000.0  | 78.1  |       | 77.2  |       | 75.7  |       |
| 2500.0  | 77.7  |       | 77.2  |       | 75.7  |       |
| 3150.0  | 77.5  |       | 77.1  |       | 75.7  |       |
| 4000.0  | 77.6  |       | 77.2  |       | 75.9  |       |
| 5000.0  | 77.1  |       | 76.8  |       | 75.1  |       |
| 6300.0  | 76.7  |       | 76.4  |       | 74.6  |       |
| 8000.0  | 75.8  |       | 75.4  |       | 73.9  |       |
| 10000.0 | 75.3  |       | 74.9  |       | 73.2  |       |
| 12500.0 | 74.8  |       | 74.2  |       | 72.6  |       |
| 16000.0 | 74.2  |       | 73.9  |       | 72.4  |       |
| 20000.0 | 73.2  |       | 72.7  |       | 71.3  |       |
| 25000.0 | 72.8  |       | 71.8  |       | 71.0  |       |
| 31500.0 | 72.0  |       | 70.5  |       | 69.9  |       |
| 40000.0 | 72.3  |       | 69.7  |       | 68.7  |       |
|         |       |       |       |       | 66.2  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 88.8  |       | 88.1  |       | 86.6  |       |
|         |       |       |       |       | 85.9  |       |
|         |       |       |       |       | 85.4  |       |
|         |       |       |       |       |       | 85.0  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.04 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 520.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 216

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.144$   
TEMPERATURE RATIO  $TR = 1.892$   
MACH NUMBER  $MJ = 0.445$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.823$   
JET DENSITY RATIO  $DJ/D0 = 0.549$   
JET VELOCITY RATIO  $VJ/A0 = 0.602$   
JET VELOCITY  $VJ = 671.1$  FPS

$TR/TJ = 1.038$   
 $DR/D0 = 0.605$   
 $DR/DJ = 1.102$   
MASS FLOW = 0.604 POUNDS PER SECOND  
THRUST = 12.79 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 58.4                        | 60.2                        | 61.0                        | 58.7                        | 58.9                        | 57.9                        |
| 250.0                                  | 61.0                        | 61.0                        | 60.8                        | 60.5                        | 61.0                        | 60.5                        |
| 315.2                                  | 62.9                        | 63.7                        | 64.0                        | 63.4                        | 62.9                        | 62.1                        |
| 400.0                                  | 65.5                        | 66.1                        | 64.9                        | 65.1                        | 64.4                        | 64.7                        |
| 500.0                                  | 67.8                        | 68.1                        | 67.8                        | 66.5                        | 65.9                        | 65.6                        |
| 630.0                                  | 70.8                        | 70.3                        | 69.8                        | 68.2                        | 68.4                        | 68.1                        |
| 800.0                                  | 73.1                        | 72.4                        | 70.7                        | 70.6                        | 69.4                        | 69.5                        |
| 1000.0                                 | 74.0                        | 73.0                        | 71.8                        | 71.7                        | 70.1                        | 69.8                        |
| 1250.0                                 | 75.1                        | 73.7                        | 73.6                        | 72.7                        | 71.6                        | 71.5                        |
| 1600.0                                 | 75.3                        | 74.5                        | 73.9                        | 73.2                        | 72.2                        | 72.1                        |
| 2000.0                                 | 75.4                        | 75.1                        | 74.7                        | 73.9                        | 72.8                        | 72.3                        |
| 2500.0                                 | 75.8                        | 75.2                        | 74.2                        | 73.9                        | 73.1                        | 72.8                        |
| 3150.0                                 | 75.8                        | 75.3                        | 74.4                        | 74.0                        | 73.2                        | 72.9                        |
| 4000.0                                 | 75.6                        | 75.2                        | 74.7                        | 73.7                        | 72.9                        | 72.6                        |
| 5000.0                                 | 74.9                        | 75.0                        | 74.5                        | 73.4                        | 72.7                        | 72.2                        |
| 6300.0                                 | 73.9                        | 75.3                        | 74.0                        | 73.3                        | 72.9                        | 72.3                        |
| 8000.0                                 | 73.9                        | 74.9                        | 72.4                        | 72.4                        | 71.7                        | 71.4                        |
| 10000.0                                | 73.8                        | 74.2                        | 72.1                        | 71.8                        | 71.0                        | 70.7                        |
| 12500.0                                | 73.7                        | 72.3                        | 71.9                        | 71.1                        | 70.7                        | 70.2                        |
| 16000.0                                | 72.0                        | 72.1                        | 70.4                        | 70.5                        | 70.1                        | 69.7                        |
| 20000.0                                | 70.4                        | 71.9                        | 70.5                        | 69.7                        | 69.4                        | 69.1                        |
| 25000.0                                | 70.8                        | 70.4                        | 69.8                        | 69.2                        | 68.7                        | 68.7                        |
| 31500.0                                | 70.7                        | 70.6                        | 69.8                        | 69.0                        | 68.5                        | 68.8                        |
| 40000.0                                | 70.1                        | 70.6                        | 69.8                        | 69.3                        | 68.1                        | 69.2                        |
| OVERALL<br>SPL                         | 86.7                        | 86.6                        | 85.6                        | 85.0                        | 84.2                        | 84.0                        |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 57.0  |       | 59.7  |       |
| 250.0   | 60.3  |       | 60.2  |       |
| 315.2   | 61.8  |       | 62.0  |       |
| 400.0   | 63.8  |       | 64.1  |       |
| 500.0   | 65.6  |       | 64.9  |       |
| 630.0   | 67.6  |       | 67.9  |       |
| 800.0   | 68.6  |       | 68.6  |       |
| 1000.0  | 69.4  |       | 69.3  |       |
| 1250.0  | 70.6  |       | 70.4  |       |
| 1600.0  | 70.7  |       | 70.1  |       |
| 2000.0  | 71.6  |       | 71.0  |       |
| 2500.0  | 72.0  |       | 71.5  |       |
| 3150.0  | 72.2  |       | 71.6  |       |
| 4000.0  | 72.1  |       | 71.6  |       |
| 5000.0  | 71.9  |       | 71.1  |       |
| 6300.0  | 71.9  |       | 70.8  |       |
| 8000.0  | 71.0  |       | 70.4  |       |
| 10000.0 | 70.4  |       | 69.5  |       |
| 12500.0 | 69.9  |       | 68.9  |       |
| 16000.0 | 69.3  |       | 68.2  |       |
| 20000.0 | 68.8  |       | 67.2  |       |
| 25000.0 | 67.9  |       | 66.3  |       |
| 31500.0 | 67.4  |       | 65.9  |       |
| 40000.0 | 67.2  |       | 66.1  |       |
|         |       |       |       |       |
| OVERALL |       |       |       |       |
| SPL     | 83.3  |       | 82.7  |       |
|         |       |       | 80.7  |       |
|         |       |       |       | 79.3  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.82 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 557.00 DEG.F, CHAMBER TEMPERATURE = 88.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 44

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.199$   
TEMPERATURE RATIO  $T_R = 1.856$   
MACH NUMBER  $M_J = 0.519$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.766$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.566$   
JET VELOCITY RATIO  $V_J/A_0 = 0.689$   
JET VELOCITY  $V_J = 791.1$  FPS

$T_R/T_J = 1.051$   
 $D_R/D_0 = 0.646$   
 $D_R/D_J = 1.140$   
MASS FLOW = 0.715 POUNDS PER SECOND  
THRUST = 17.35 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 74.6                                  | 73.9                                  | 70.4                                  | 0.0                                   | 67.4                                  | 65.6                                  |
| 250.0                                  | 77.3                                  | 77.0                                  | 75.0                                  | 0.0                                   | 71.0                                  | 68.3                                  |
| 315.2                                  | 81.4                                  | 79.4                                  | 79.9                                  | 0.0                                   | 73.9                                  | 71.0                                  |
| 400.0                                  | 83.4                                  | 83.7                                  | 80.7                                  | 0.0                                   | 77.0                                  | 73.8                                  |
| 500.0                                  | 87.1                                  | 84.5                                  | 83.4                                  | 0.0                                   | 79.9                                  | 75.7                                  |
| 630.0                                  | 86.1                                  | 86.8                                  | 86.1                                  | 0.0                                   | 82.1                                  | 78.0                                  |
| 800.0                                  | 89.0                                  | 89.2                                  | 88.3                                  | 0.0                                   | 83.8                                  | 80.1                                  |
| 1000.0                                 | 88.0                                  | 89.0                                  | 89.4                                  | 0.0                                   | 85.3                                  | 81.6                                  |
| 1250.0                                 | 86.7                                  | 88.9                                  | 89.5                                  | 0.0                                   | 86.4                                  | 82.7                                  |
| 1600.0                                 | 83.7                                  | 86.6                                  | 87.9                                  | 0.0                                   | 86.3                                  | 83.3                                  |
| 2000.0                                 | 81.0                                  | 84.6                                  | 86.6                                  | 0.0                                   | 86.5                                  | 83.6                                  |
| 2500.0                                 | 78.2                                  | 82.3                                  | 84.6                                  | 0.0                                   | 85.9                                  | 83.5                                  |
| 3150.0                                 | 75.8                                  | 80.2                                  | 82.9                                  | 0.0                                   | 85.6                                  | 83.2                                  |
| 4000.0                                 | 75.4                                  | 79.1                                  | 81.8                                  | 0.0                                   | 85.3                                  | 82.9                                  |
| 5000.0                                 | 73.4                                  | 77.1                                  | 79.8                                  | 0.0                                   | 84.0                                  | 82.4                                  |
| 6300.0                                 | 72.9                                  | 75.7                                  | 77.9                                  | 0.0                                   | 82.7                                  | 81.9                                  |
| 8000.0                                 | 71.8                                  | 73.8                                  | 76.3                                  | 0.0                                   | 81.5                                  | 80.8                                  |
| 10000.0                                | 71.8                                  | 71.9                                  | 75.0                                  | 0.0                                   | 80.5                                  | 80.2                                  |
| 12500.0                                | 71.7                                  | 70.7                                  | 73.3                                  | 0.0                                   | 79.1                                  | 79.3                                  |
| 16000.0                                | 69.9                                  | 69.8                                  | 71.9                                  | 0.0                                   | 77.9                                  | 78.6                                  |
| 20000.0                                | 66.7                                  | 67.4                                  | 70.0                                  | 0.0                                   | 76.1                                  | 77.5                                  |
| 25000.0                                | 64.8                                  | 66.6                                  | 68.8                                  | 0.0                                   | 75.0                                  | 77.0                                  |
| 31500.0                                | 63.0                                  | 66.1                                  | 67.1                                  | 0.0                                   | 73.3                                  | 76.0                                  |
| 40000.0                                | 62.2                                  | 66.8                                  | 65.5                                  | 0.0                                   | 71.8                                  | 75.7                                  |
| OVERALL<br>SPL                         | 95.9                                  | 96.8                                  | 97.3                                  | 90.8                                  | 96.3                                  | 94.1                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 63.6                                  | 62.2                                  | 61.9                                  | 61.3                                   | 61.6                                   | 62.2                                   |
| 250.0                                  | 66.2                                  | 64.9                                  | 63.6                                  | 62.7                                   | 63.0                                   | 62.5                                   |
| 315.2                                  | 68.2                                  | 66.8                                  | 66.3                                  | 65.8                                   | 65.6                                   | 65.5                                   |
| 400.0                                  | 71.0                                  | 69.8                                  | 68.2                                  | 67.6                                   | 67.6                                   | 66.6                                   |
| 500.0                                  | 73.3                                  | 72.5                                  | 70.8                                  | 70.0                                   | 69.7                                   | 68.7                                   |
| 630.0                                  | 75.5                                  | 74.2                                  | 73.4                                  | 72.2                                   | 71.7                                   | 71.3                                   |
| 800.0                                  | 77.0                                  | 76.4                                  | 75.0                                  | 74.1                                   | 73.5                                   | 72.8                                   |
| 1000.0                                 | 79.3                                  | 78.2                                  | 76.5                                  | 75.9                                   | 74.8                                   | 74.2                                   |
| 1250.0                                 | 80.1                                  | 79.9                                  | 78.2                                  | 77.1                                   | 76.4                                   | 75.9                                   |
| 1600.0                                 | 81.0                                  | 80.4                                  | 78.8                                  | 77.6                                   | 77.0                                   | 76.6                                   |
| 2000.0                                 | 81.6                                  | 81.2                                  | 79.8                                  | 78.6                                   | 78.0                                   | 77.5                                   |
| 2500.0                                 | 81.9                                  | 81.5                                  | 80.0                                  | 78.8                                   | 78.2                                   | 77.8                                   |
| 3150.0                                 | 81.8                                  | 81.6                                  | 80.2                                  | 79.4                                   | 78.7                                   | 78.4                                   |
| 4000.0                                 | 82.0                                  | 81.9                                  | 80.5                                  | 79.6                                   | 79.1                                   | 78.7                                   |
| 5000.0                                 | 81.7                                  | 81.8                                  | 80.1                                  | 79.3                                   | 79.0                                   | 78.5                                   |
| 6300.0                                 | 81.6                                  | 81.2                                  | 79.8                                  | 79.1                                   | 78.9                                   | 78.6                                   |
| 8000.0                                 | 80.8                                  | 80.6                                  | 79.2                                  | 78.4                                   | 78.2                                   | 78.0                                   |
| 10000.0                                | 80.5                                  | 80.2                                  | 78.5                                  | 78.1                                   | 77.9                                   | 78.0                                   |
| 12500.0                                | 79.8                                  | 79.4                                  | 77.9                                  | 77.4                                   | 77.3                                   | 77.5                                   |
| 16000.0                                | 79.0                                  | 78.9                                  | 77.7                                  | 76.7                                   | 77.0                                   | 77.0                                   |
| 20000.0                                | 78.0                                  | 77.7                                  | 76.6                                  | 75.6                                   | 75.7                                   | 75.5                                   |
| 25000.0                                | 77.5                                  | 76.6                                  | 75.9                                  | 74.6                                   | 75.0                                   | 74.5                                   |
| 31500.0                                | 76.3                                  | 75.1                                  | 74.6                                  | 73.0                                   | 73.7                                   | 72.9                                   |
| 40000.0                                | 76.2                                  | 74.3                                  | 73.6                                  | 71.7                                   | 73.2                                   | 71.6                                   |
| OVERALL<br>SPL                         | 92.9                                  | 92.5                                  | 91.1                                  | 90.2                                   | 89.9                                   | 89.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.82 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 538.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.380

RUN NUMBER 217

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.199$   
TEMPERATURE RATIO  $TR = 1.927$   
MACH NUMBER  $MJ = 0.519$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.833$   
JET DENSITY RATIO  $DJ/D_0 = 0.546$   
JET VELOCITY RATIO  $VJ/A_0 = 0.703$   
JET VELOCITY  $VJ = 784.1$  FPS

$TR/TJ = 1.051$   
 $DR/D_0 = 0.622$   
 $DR/DJ = 1.140$   
MASS FLOW = 0.702 POUNDS PER SECOND  
THRUST = 17.37 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|--|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
|  | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|  | 10             | 82.5  | 11             | 90.0  | 12             | 97.5  | 13             | 105.0 | 14             | 112.5 | 15             | 120.0 |
| 200.0                                  | 61.0           |       | 62.2           |       | 61.2           |       | 61.5           |       | 60.6           |       | 59.9           |       |
| 250.0                                  | 63.3           |       | 63.4           |       | 62.9           |       | 62.9           |       | 63.7           |       | 63.2           |       |
| 315.2                                  | 65.0           |       | 65.8           |       | 66.6           |       | 66.2           |       | 66.4           |       | 64.9           |       |
| 400.0                                  | 68.7           |       | 68.2           |       | 67.7           |       | 67.1           |       | 67.1           |       | 67.0           |       |
| 500.0                                  | 70.8           |       | 70.4           |       | 70.6           |       | 69.7           |       | 69.3           |       | 69.2           |       |
| 630.0                                  | 73.4           |       | 72.8           |       | 72.3           |       | 71.4           |       | 70.9           |       | 71.0           |       |
| 800.0                                  | 76.4           |       | 75.0           |       | 74.1           |       | 72.4           |       | 72.5           |       | 72.0           |       |
| 1000.0                                 | 78.0           |       | 76.1           |       | 74.8           |       | 74.3           |       | 73.5           |       | 72.8           |       |
| 1250.0                                 | 79.0           |       | 77.2           |       | 77.3           |       | 76.0           |       | 75.1           |       | 74.6           |       |
| 1600.0                                 | 79.4           |       | 78.0           |       | 77.4           |       | 76.7           |       | 76.1           |       | 75.3           |       |
| 2000.0                                 | 79.8           |       | 79.0           |       | 78.2           |       | 77.5           |       | 76.5           |       | 76.1           |       |
| 2500.0                                 | 80.0           |       | 79.2           |       | 78.2           |       | 77.7           |       | 76.9           |       | 76.4           |       |
| 3150.0                                 | 80.3           |       | 79.5           |       | 78.5           |       | 78.0           |       | 77.7           |       | 76.9           |       |
| 4000.0                                 | 80.4           |       | 79.7           |       | 79.1           |       | 78.1           |       | 77.5           |       | 76.8           |       |
| 5000.0                                 | 79.8           |       | 79.5           |       | 79.1           |       | 77.9           |       | 77.5           |       | 76.7           |       |
| 6300.0                                 | 79.5           |       | 79.8           |       | 78.8           |       | 77.7           |       | 77.6           |       | 77.0           |       |
| 8000.0                                 | 79.3           |       | 79.9           |       | 77.4           |       | 77.2           |       | 76.6           |       | 75.8           |       |
| 10000.0                                | 79.3           |       | 79.0           |       | 76.9           |       | 76.5           |       | 76.1           |       | 75.4           |       |
| 12500.0                                | 79.1           |       | 77.3           |       | 76.7           |       | 76.0           |       | 75.7           |       | 74.8           |       |
| 16000.0                                | 77.6           |       | 77.1           |       | 75.0           |       | 75.3           |       | 74.9           |       | 74.3           |       |
| 20000.0                                | 75.8           |       | 76.9           |       | 74.9           |       | 74.6           |       | 74.1           |       | 73.5           |       |
| 25000.0                                | 76.1           |       | 75.3           |       | 74.2           |       | 74.0           |       | 73.5           |       | 73.1           |       |
| 31500.0                                | 76.2           |       | 75.4           |       | 73.8           |       | 73.8           |       | 73.3           |       | 73.1           |       |
| 40000.0                                | 75.3           |       | 75.4           |       | 73.6           |       | 74.2           |       | 72.8           |       | 73.6           |       |
| OVERALL<br>SPL                         | 91.4           |       | 90.8           |       | 89.7           |       | 89.1           |       | 88.5           |       | 88.0           |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 59.0                        | 60.4                        | 59.4                        | 60.9                        |
| 250.0                                  | 63.1                        | 62.3                        | 62.2                        | 61.2                        |
| 315.2                                  | 64.4                        | 64.0                        | 63.4                        | 63.0                        |
| 400.0                                  | 66.5                        | 65.5                        | 65.6                        | 65.4                        |
| 500.0                                  | 67.8                        | 66.7                        | 66.4                        | 65.8                        |
| 630.0                                  | 70.7                        | 69.9                        | 67.9                        | 66.5                        |
| 800.0                                  | 71.6                        | 70.6                        | 70.0                        | 68.5                        |
| 1000.0                                 | 72.0                        | 71.5                        | 70.7                        | 69.4                        |
| 1250.0                                 | 73.4                        | 72.8                        | 71.6                        | 69.7                        |
| 1600.0                                 | 74.2                        | 73.1                        | 72.1                        | 70.3                        |
| 2000.0                                 | 75.2                        | 74.0                        | 72.8                        | 70.6                        |
| 2500.0                                 | 75.7                        | 74.5                        | 73.1                        | 71.0                        |
| 3150.0                                 | 76.0                        | 74.9                        | 73.3                        | 71.0                        |
| 4000.0                                 | 76.2                        | 74.9                        | 73.4                        | 70.9                        |
| 5000.0                                 | 76.2                        | 74.5                        | 72.7                        | 70.5                        |
| 6300.0                                 | 76.0                        | 74.5                        | 72.7                        | 70.6                        |
| 8000.0                                 | 75.6                        | 74.1                        | 71.8                        | 69.6                        |
| 10000.0                                | 74.9                        | 73.2                        | 70.7                        | 68.5                        |
| 12500.0                                | 74.4                        | 72.8                        | 69.8                        | 67.7                        |
| 16000.0                                | 73.8                        | 72.1                        | 69.1                        | 66.4                        |
| 20000.0                                | 73.0                        | 71.1                        | 68.2                        | 65.2                        |
| 25000.0                                | 72.4                        | 70.2                        | 67.3                        | 63.8                        |
| 31500.0                                | 71.9                        | 69.7                        | 66.9                        | 63.0                        |
| 40000.0                                | 71.6                        | 70.0                        | 66.6                        | 62.4                        |
| OVERALL<br>SPL                         | 87.2                        | 85.8                        | 84.1                        | 82.0                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 3.75 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 571.00 DEG.F, CHAMBER TEMPERATURE = 88.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.377

RUN NUMBER 45

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.264$   
TEMPERATURE RATIO  $TR = 1.881$   
MACH NUMBER  $MJ = 0.593$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.764$   
JET DENSITY RATIO  $DJ/D0 = 0.567$   
JET VELOCITY RATIO  $VJ/A0 = 0.788$   
JET VELOCITY  $VJ = 903.7$  FPS

$TR/TJ = 1.066$   
 $DR/D0 = 0.672$   
 $DR/DJ = 1.186$   
MASS FLOW = 0.817 POUNDS PER SECOND  
THRUST = 22.66 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 77.2                                  | 77.2                                  | 74.0                                  | 70.8                                  | 70.4                                  | 67.4                                  |
| 250.0                                  | 80.3                                  | 80.1                                  | 78.2                                  | 75.4                                  | 73.8                                  | 70.6                                  |
| 315.2                                  | 84.3                                  | 82.9                                  | 82.6                                  | 79.2                                  | 76.8                                  | 74.6                                  |
| 400.0                                  | 86.3                                  | 87.6                                  | 84.1                                  | 81.7                                  | 80.2                                  | 77.8                                  |
| 500.0                                  | 89.8                                  | 88.7                                  | 88.0                                  | 84.0                                  | 82.4                                  | 79.2                                  |
| 630.0                                  | 89.3                                  | 90.8                                  | 90.2                                  | 87.0                                  | 85.0                                  | 81.9                                  |
| 800.0                                  | 92.7                                  | 93.3                                  | 92.3                                  | 89.2                                  | 87.3                                  | 84.2                                  |
| 1000.0                                 | 91.6                                  | 93.2                                  | 93.8                                  | 91.0                                  | 89.4                                  | 86.0                                  |
| 1250.0                                 | 91.3                                  | 93.8                                  | 94.4                                  | 91.7                                  | 90.4                                  | 87.6                                  |
| 1600.0                                 | 88.7                                  | 91.9                                  | 92.9                                  | 91.0                                  | 90.4                                  | 88.3                                  |
| 2000.0                                 | 85.9                                  | 89.7                                  | 91.6                                  | 90.6                                  | 90.7                                  | 89.0                                  |
| 2500.0                                 | 82.6                                  | 87.3                                  | 89.5                                  | 89.4                                  | 90.3                                  | 88.8                                  |
| 3150.0                                 | 79.9                                  | 85.4                                  | 87.6                                  | 88.1                                  | 89.9                                  | 88.8                                  |
| 4000.0                                 | 79.0                                  | 83.8                                  | 86.6                                  | 87.3                                  | 89.7                                  | 88.7                                  |
| 5000.0                                 | 76.8                                  | 82.2                                  | 84.8                                  | 85.5                                  | 88.4                                  | 88.1                                  |
| 6300.0                                 | 75.9                                  | 80.7                                  | 83.4                                  | 84.3                                  | 87.5                                  | 87.5                                  |
| 8000.0                                 | 74.9                                  | 78.9                                  | 81.5                                  | 82.7                                  | 86.1                                  | 86.3                                  |
| 10000.0                                | 74.9                                  | 77.1                                  | 80.3                                  | 81.4                                  | 85.2                                  | 85.4                                  |
| 12500.0                                | 74.8                                  | 75.8                                  | 78.9                                  | 80.3                                  | 84.1                                  | 84.6                                  |
| 16000.0                                | 73.0                                  | 74.7                                  | 77.5                                  | 78.8                                  | 82.9                                  | 83.7                                  |
| 20000.0                                | 69.9                                  | 72.1                                  | 75.6                                  | 77.0                                  | 81.2                                  | 82.4                                  |
| 25000.0                                | 67.8                                  | 71.4                                  | 74.2                                  | 75.6                                  | 80.0                                  | 81.5                                  |
| 31500.0                                | 65.6                                  | 70.3                                  | 72.5                                  | 73.5                                  | 78.2                                  | 80.1                                  |
| 40000.0                                | 63.8                                  | 70.1                                  | 70.9                                  | 72.3                                  | 76.8                                  | 78.9                                  |
| OVERALL<br>SPL                         | 99.6                                  | 101.3                                 | 101.9                                 | 100.1                                 | 100.5                                 | 99.2                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 65.4                                  | 64.4                                  | 64.6                                  | 63.0                                   | 64.6                                   | 64.1                                   |
| 250.0                                  | 69.0                                  | 67.3                                  | 66.6                                  | 65.9                                   | 66.6                                   | 65.6                                   |
| 315.2                                  | 71.3                                  | 69.5                                  | 68.2                                  | 68.4                                   | 67.7                                   | 67.3                                   |
| 400.0                                  | 74.7                                  | 72.4                                  | 70.8                                  | 70.6                                   | 70.1                                   | 69.2                                   |
| 500.0                                  | 76.8                                  | 74.0                                  | 73.0                                  | 71.8                                   | 71.4                                   | 70.7                                   |
| 630.0                                  | 79.7                                  | 76.8                                  | 75.7                                  | 74.6                                   | 74.1                                   | 73.3                                   |
| 800.0                                  | 81.5                                  | 79.4                                  | 77.8                                  | 76.7                                   | 76.2                                   | 75.9                                   |
| 1000.0                                 | 83.4                                  | 81.0                                  | 79.7                                  | 78.4                                   | 77.5                                   | 77.0                                   |
| 1250.0                                 | 85.0                                  | 82.9                                  | 81.7                                  | 80.5                                   | 79.5                                   | 79.2                                   |
| 1600.0                                 | 86.2                                  | 83.9                                  | 82.4                                  | 81.0                                   | 80.2                                   | 79.9                                   |
| 2000.0                                 | 86.8                                  | 85.1                                  | 83.4                                  | 82.0                                   | 81.0                                   | 80.7                                   |
| 2500.0                                 | 87.0                                  | 85.2                                  | 83.9                                  | 82.5                                   | 81.6                                   | 81.3                                   |
| 3150.0                                 | 87.3                                  | 85.6                                  | 84.2                                  | 83.4                                   | 82.3                                   | 81.9                                   |
| 4000.0                                 | 87.5                                  | 86.3                                  | 85.0                                  | 83.5                                   | 82.9                                   | 82.3                                   |
| 5000.0                                 | 87.2                                  | 86.2                                  | 84.6                                  | 83.5                                   | 82.9                                   | 82.5                                   |
| 6300.0                                 | 87.0                                  | 85.9                                  | 84.4                                  | 83.7                                   | 82.8                                   | 82.6                                   |
| 8000.0                                 | 86.3                                  | 85.2                                  | 83.9                                  | 82.9                                   | 82.3                                   | 82.2                                   |
| 10000.0                                | 86.0                                  | 84.8                                  | 83.3                                  | 82.7                                   | 82.0                                   | 82.2                                   |
| 12500.0                                | 85.3                                  | 84.3                                  | 83.0                                  | 82.1                                   | 81.4                                   | 81.9                                   |
| 16000.0                                | 84.5                                  | 83.9                                  | 83.0                                  | 81.4                                   | 81.3                                   | 81.3                                   |
| 20000.0                                | 83.3                                  | 82.7                                  | 81.9                                  | 80.4                                   | 80.3                                   | 80.1                                   |
| 25000.0                                | 82.3                                  | 81.8                                  | 81.5                                  | 79.5                                   | 79.5                                   | 79.2                                   |
| 31500.0                                | 80.6                                  | 80.4                                  | 80.2                                  | 77.9                                   | 78.2                                   | 77.7                                   |
| 40000.0                                | 79.1                                  | 79.5                                  | 79.0                                  | 76.4                                   | 77.6                                   | 76.4                                   |
| OVERALL<br>SPL                         | 98.1                                  | 96.7                                  | 95.4                                  | 94.2                                   | 93.6                                   | 93.4                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 3.70 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 542.00 DEG.F, CHAMBER TEMPERATURE = 55.00 DEG.F  
RELATIVE HUMIDITY = 64.0 PERCENT  
GAMMA = 1.377

RUN NUMBER 146

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.264  
TEMPERATURE RATIO TR = 1.946  
MACH NUMBER MJ = 0.593  
JET STATIC TEMPERATURE RATIO TJ/TO = 1.825  
JET DENSITY RATIO DJ/DO = 0.548  
JET VELOCITY RATIO VJ/A0 = 0.801  
JET VELOCITY VJ = 891.2 FPS

TR/TJ = 1.066  
DR/DO = 0.650  
DR/DJ = 1.186  
MASS FLOW = 0.804 POUNDS PER SECOND  
THRUST = 22.67 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 63.0                                   | 64.4                                   | 65.4                                   | 63.7                                    | 62.9                                    | 61.6                                    |
| 250.0                                  | 66.2                                   | 65.6                                   | 65.0                                   | 64.9                                    | 65.0                                    | 65.4                                    |
| 315.2                                  | 68.0                                   | 68.0                                   | 68.6                                   | 68.3                                    | 68.4                                    | 67.9                                    |
| 400.0                                  | 70.9                                   | 71.0                                   | 70.5                                   | 69.9                                    | 70.1                                    | 69.6                                    |
| 500.0                                  | 73.8                                   | 72.8                                   | 73.2                                   | 72.6                                    | 71.7                                    | 71.3                                    |
| 630.0                                  | 76.6                                   | 75.8                                   | 75.2                                   | 74.4                                    | 73.9                                    | 74.2                                    |
| 800.0                                  | 79.0                                   | 78.1                                   | 77.0                                   | 75.4                                    | 75.2                                    | 75.2                                    |
| 1000.0                                 | 80.8                                   | 79.5                                   | 78.1                                   | 77.2                                    | 76.2                                    | 75.9                                    |
| 1250.0                                 | 82.6                                   | 80.5                                   | 80.2                                   | 78.9                                    | 78.1                                    | 77.7                                    |
| 1600.0                                 | 83.1                                   | 81.5                                   | 80.5                                   | 79.5                                    | 79.0                                    | 78.6                                    |
| 2000.0                                 | 83.5                                   | 82.5                                   | 81.7                                   | 80.5                                    | 79.7                                    | 79.4                                    |
| 2500.0                                 | 84.0                                   | 82.9                                   | 82.0                                   | 80.8                                    | 80.3                                    | 80.0                                    |
| 3150.0                                 | 84.5                                   | 83.1                                   | 82.6                                   | 81.6                                    | 80.8                                    | 80.4                                    |
| 4000.0                                 | 84.5                                   | 83.6                                   | 82.8                                   | 81.6                                    | 81.1                                    | 80.5                                    |
| 5000.0                                 | 84.1                                   | 83.3                                   | 82.9                                   | 81.4                                    | 80.7                                    | 80.4                                    |
| 6300.0                                 | 83.8                                   | 83.9                                   | 83.1                                   | 81.4                                    | 81.0                                    | 80.8                                    |
| 8000.0                                 | 83.8                                   | 83.9                                   | 81.8                                   | 80.9                                    | 80.4                                    | 80.1                                    |
| 10000.0                                | 83.7                                   | 83.4                                   | 81.6                                   | 80.3                                    | 79.9                                    | 80.0                                    |
| 12500.0                                | 83.3                                   | 81.8                                   | 81.5                                   | 79.9                                    | 79.6                                    | 79.1                                    |
| 16000.0                                | 81.3                                   | 81.1                                   | 79.9                                   | 78.9                                    | 78.7                                    | 78.4                                    |
| 20000.0                                | 79.5                                   | 81.1                                   | 79.5                                   | 78.0                                    | 77.8                                    | 77.8                                    |
| 25000.0                                | 79.7                                   | 79.6                                   | 79.0                                   | 77.2                                    | 77.2                                    | 77.4                                    |
| 31500.0                                | 78.8                                   | 79.6                                   | 78.4                                   | 76.5                                    | 76.7                                    | 77.1                                    |
| 40000.0                                | 77.6                                   | 79.5                                   | 78.1                                   | 76.5                                    | 75.9                                    | 77.4                                    |
| OVERALL<br>SPL                         | 95.3                                   | 94.6                                   | 93.7                                   | 92.4                                    | 91.9                                    | 91.7                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE | MICRO<br>PHONE | MICRO<br>PHONE | MICRO<br>PHONE |
|-------------------------|----------------|----------------|----------------|----------------|
| FREQ.<br>HZ             | NO. ANGLE      | NO. ANGLE      | NO. ANGLE      | NO. ANGLE      |
|                         | 16 127.5       | 17 135.0       | 18 142.5       | 19 150.0       |
| 200.0                   | 61.2           | 62.1           | 62.0           | 63.9           |
| 250.0                   | 65.3           | 64.8           | 64.6           | 64.3           |
| 315.2                   | 66.8           | 66.1           | 65.7           | 65.6           |
| 400.0                   | 68.8           | 68.0           | 68.2           | 67.5           |
| 500.0                   | 71.0           | 69.8           | 69.6           | 68.5           |
| 630.0                   | 73.6           | 72.8           | 71.0           | 69.0           |
| 800.0                   | 74.2           | 73.3           | 72.6           | 70.5           |
| 1000.0                  | 75.0           | 74.3           | 73.9           | 71.8           |
| 1250.0                  | 76.5           | 76.1           | 74.8           | 72.6           |
| 1600.0                  | 77.6           | 76.5           | 75.2           | 73.3           |
| 2000.0                  | 78.5           | 77.9           | 76.3           | 73.9           |
| 2500.0                  | 79.0           | 78.3           | 76.4           | 74.3           |
| 3150.0                  | 79.6           | 78.8           | 77.0           | 74.5           |
| 4000.0                  | 80.0           | 79.1           | 77.4           | 74.5           |
| 5000.0                  | 79.9           | 78.4           | 76.9           | 74.0           |
| 6300.0                  | 80.1           | 78.8           | 76.9           | 74.3           |
| 8000.0                  | 79.6           | 78.4           | 76.0           | 73.7           |
| 10000.0                 | 79.0           | 77.0           | 76.3           | 72.1           |
| 12500.0                 | 78.4           | 77.1           | 74.4           | 72.2           |
| 16000.0                 | 77.6           | 76.2           | 73.5           | 70.7           |
| 20000.0                 | 76.7           | 75.2           | 72.2           | 69.4           |
| 25000.0                 | 76.0           | 74.4           | 71.4           | 68.0           |
| 31500.0                 | 75.2           | 73.8           | 70.7           | 66.9           |
| 40000.0                 | 74.8           | 73.7           | 70.0           | 66.0           |
| OVERALL<br>SPL          | 90.8           | 89.7           | 87.9           | 85.4           |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.86 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 588.00 DEG.F, CHAMBER TEMPERATURE = 89.00 DEG.F  
RELATIVE HUMIDITY = 30.0 PERCENT  
GAMMA = 1.375

RUN NUMBER 46

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.342  
TEMPERATURE RATIO TR = 1.909  
MACH NUMBER MJ = 0.668  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.762  
JET DENSITY RATIO DJ/D0 = 0.568  
JET VELOCITY RATIO VJ/A0 = 0.886  
JET VELOCITY VJ = 1017.8 FPS

TR/TJ = 1.084  
DR/D0 = 0.703  
DR/DJ = 1.239  
MASS FLOW = 0.921 POUNDS PER SECOND  
THRUST = 28.73 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 79.9  | 80.3  | 76.7  | 73.7  | 73.3  | 69.8  |
| 250.0   | 83.4  | 83.4  | 80.6  | 77.7  | 75.8  | 73.0  |
| 315.2   | 87.4  | 85.8  | 85.4  | 81.3  | 79.5  | 76.6  |
| 400.0   | 90.0  | 90.7  | 87.4  | 84.5  | 83.2  | 80.2  |
| 500.0   | 93.4  | 91.8  | 90.6  | 87.4  | 86.2  | 82.1  |
| 630.0   | 92.6  | 93.8  | 93.4  | 90.3  | 88.6  | 84.8  |
| 800.0   | 96.2  | 97.0  | 95.8  | 92.8  | 90.7  | 87.3  |
| 1000.0  | 95.6  | 97.3  | 97.6  | 95.0  | 92.8  | 89.6  |
| 1250.0  | 95.7  | 98.7  | 98.8  | 96.5  | 94.8  | 91.0  |
| 1600.0  | 94.6  | 97.5  | 98.0  | 96.1  | 94.6  | 91.9  |
| 2000.0  | 92.2  | 95.5  | 96.7  | 95.2  | 95.0  | 92.5  |
| 2500.0  | 88.7  | 92.5  | 93.9  | 93.8  | 94.3  | 92.6  |
| 3150.0  | 85.4  | 90.1  | 92.0  | 92.5  | 93.9  | 92.7  |
| 4000.0  | 84.2  | 88.6  | 90.8  | 91.6  | 93.7  | 92.7  |
| 5000.0  | 82.2  | 86.6  | 89.0  | 89.9  | 92.5  | 92.3  |
| 6300.0  | 81.1  | 85.2  | 87.4  | 88.5  | 91.8  | 91.8  |
| 8000.0  | 79.9  | 83.7  | 86.0  | 86.8  | 90.4  | 90.7  |
| 10000.0 | 79.4  | 82.1  | 84.7  | 85.8  | 89.4  | 90.2  |
| 12500.0 | 79.0  | 80.7  | 83.2  | 84.5  | 88.6  | 89.2  |
| 16000.0 | 77.1  | 79.8  | 81.7  | 83.2  | 87.5  | 88.3  |
| 20000.0 | 74.0  | 77.8  | 80.1  | 81.5  | 85.5  | 86.9  |
| 25000.0 | 72.0  | 76.5  | 79.0  | 80.1  | 84.1  | 86.1  |
| 31500.0 | 70.0  | 74.9  | 77.1  | 78.0  | 82.2  | 84.6  |
| 40000.0 | 68.4  | 74.0  | 75.5  | 76.5  | 80.4  | 83.5  |
| OVERALL |       |       |       |       |       |       |
| SPL     | 103.8 | 105.8 | 106.1 | 104.5 | 104.6 | 103.1 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 67.3                                  | 68.1                                  | 67.2                                  | 66.8                                   | 67.0                                   | 66.4                                   |
| 250.0                                  | 71.0                                  | 70.3                                  | 69.0                                  | 69.0                                   | 68.8                                   | 67.9                                   |
| 315.2                                  | 73.5                                  | 72.1                                  | 71.7                                  | 71.2                                   | 70.8                                   | 70.4                                   |
| 400.0                                  | 77.0                                  | 74.5                                  | 73.7                                  | 73.0                                   | 72.7                                   | 72.2                                   |
| 500.0                                  | 79.2                                  | 76.7                                  | 75.7                                  | 74.4                                   | 73.9                                   | 73.4                                   |
| 630.0                                  | 81.8                                  | 79.3                                  | 78.1                                  | 77.2                                   | 77.0                                   | 75.8                                   |
| 800.0                                  | 84.7                                  | 81.9                                  | 80.4                                  | 78.8                                   | 78.6                                   | 78.2                                   |
| 1000.0                                 | 86.4                                  | 84.0                                  | 82.3                                  | 80.8                                   | 80.1                                   | 79.7                                   |
| 1250.0                                 | 88.2                                  | 86.1                                  | 84.4                                  | 82.9                                   | 82.2                                   | 81.6                                   |
| 1600.0                                 | 89.0                                  | 86.9                                  | 85.3                                  | 84.0                                   | 83.4                                   | 82.5                                   |
| 2000.0                                 | 90.3                                  | 88.4                                  | 86.6                                  | 85.0                                   | 84.4                                   | 83.3                                   |
| 2500.0                                 | 90.7                                  | 88.8                                  | 87.0                                  | 85.7                                   | 84.8                                   | 83.9                                   |
| 3150.0                                 | 91.1                                  | 89.2                                  | 87.5                                  | 86.5                                   | 85.8                                   | 84.8                                   |
| 4000.0                                 | 91.5                                  | 90.0                                  | 88.3                                  | 86.9                                   | 86.3                                   | 85.4                                   |
| 5000.0                                 | 91.3                                  | 89.9                                  | 88.1                                  | 87.0                                   | 86.4                                   | 85.5                                   |
| 6300.0                                 | 91.0                                  | 89.9                                  | 88.0                                  | 86.9                                   | 86.5                                   | 85.9                                   |
| 8000.0                                 | 90.5                                  | 89.4                                  | 87.5                                  | 86.3                                   | 86.3                                   | 85.2                                   |
| 10000.0                                | 90.1                                  | 89.2                                  | 87.2                                  | 86.3                                   | 86.0                                   | 85.3                                   |
| 12500.0                                | 89.3                                  | 88.6                                  | 86.8                                  | 85.8                                   | 85.5                                   | 84.8                                   |
| 16000.0                                | 88.5                                  | 88.3                                  | 86.6                                  | 85.1                                   | 85.3                                   | 84.5                                   |
| 20000.0                                | 87.3                                  | 87.1                                  | 85.7                                  | 84.0                                   | 84.1                                   | 83.2                                   |
| 25000.0                                | 86.2                                  | 86.2                                  | 85.1                                  | 83.2                                   | 83.2                                   | 82.2                                   |
| 31500.0                                | 84.5                                  | 84.8                                  | 83.9                                  | 81.6                                   | 81.8                                   | 80.6                                   |
| 40000.0                                | 83.2                                  | 83.9                                  | 82.8                                  | 80.0                                   | 80.9                                   | 79.2                                   |
| OVERALL<br>SPL                         | 101.8                                 | 100.5                                 | 98.9                                  | 97.5                                   | 97.2                                   | 96.3                                   |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.79 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 556.00 DEG.F, CHAMBER TEMPERATURE = 55.00 DEG.F  
RELATIVE HUMIDITY = 64.0 PERCENT  
GAMMA = 1.375

RUN NUMBER 147

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.342$   
TEMPERATURE RATIO  $TR = 1.973$   
MACH NUMBER  $MJ = 0.668$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.821$   
JET DENSITY RATIO  $DJ/DO = 0.549$   
JET VELOCITY RATIO  $VJ/AO = 0.901$   
JET VELOCITY  $VJ = 1002.0$  FPS

$TR/TJ = 1.084$   
 $DR/DO = 0.680$   
 $DR/DJ = 1.239$   
MASS FLOW = 0.906 POUNDS PER SECOND  
THRUST = 28.73 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>120.0 |
|--|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 65.3                        |               | 67.2                        |               | 67.1                        |               | 66.1                        |                | 65.0                        |                | 64.0                        |                |
| 250.0                                  | 67.8                        |               | 68.7                        |               | 66.9                        |               | 66.9                        |                | 67.4                        |                | 67.3                        |                |
| 315.2                                  | 70.4                        |               | 70.6                        |               | 70.6                        |               | 70.3                        |                | 70.1                        |                | 70.4                        |                |
| 400.0                                  | 72.8                        |               | 73.0                        |               | 72.7                        |               | 71.8                        |                | 71.8                        |                | 70.9                        |                |
| 500.0                                  | 76.2                        |               | 75.4                        |               | 75.5                        |               | 74.7                        |                | 74.8                        |                | 73.6                        |                |
| 630.0                                  | 78.9                        |               | 78.1                        |               | 77.2                        |               | 76.8                        |                | 76.4                        |                | 76.3                        |                |
| 800.0                                  | 80.9                        |               | 80.2                        |               | 79.2                        |               | 77.6                        |                | 77.8                        |                | 77.3                        |                |
| 1000.0                                 | 83.2                        |               | 81.6                        |               | 80.5                        |               | 79.4                        |                | 78.6                        |                | 77.9                        |                |
| 1250.0                                 | 85.0                        |               | 83.2                        |               | 82.6                        |               | 81.2                        |                | 80.9                        |                | 79.9                        |                |
| 1600.0                                 | 85.5                        |               | 84.1                        |               | 83.0                        |               | 82.1                        |                | 81.5                        |                | 80.7                        |                |
| 2000.0                                 | 86.3                        |               | 85.3                        |               | 84.4                        |               | 83.3                        |                | 82.2                        |                | 81.8                        |                |
| 2500.0                                 | 86.7                        |               | 85.6                        |               | 84.8                        |               | 83.9                        |                | 83.1                        |                | 82.2                        |                |
| 3150.0                                 | 87.7                        |               | 86.3                        |               | 85.3                        |               | 84.7                        |                | 83.6                        |                | 82.8                        |                |
| 4000.0                                 | 87.6                        |               | 86.8                        |               | 85.8                        |               | 84.8                        |                | 84.0                        |                | 83.1                        |                |
| 5000.0                                 | 87.1                        |               | 86.7                        |               | 85.8                        |               | 84.6                        |                | 84.0                        |                | 83.0                        |                |
| 6300.0                                 | 87.2                        |               | 87.4                        |               | 86.1                        |               | 84.9                        |                | 84.4                        |                | 83.6                        |                |
| 8000.0                                 | 87.2                        |               | 87.5                        |               | 84.9                        |               | 84.3                        |                | 83.6                        |                | 82.9                        |                |
| 10000.0                                | 87.2                        |               | 86.5                        |               | 85.0                        |               | 83.4                        |                | 83.3                        |                | 82.5                        |                |
| 12500.0                                | 87.1                        |               | 85.4                        |               | 84.7                        |               | 83.4                        |                | 82.9                        |                | 82.1                        |                |
| 16000.0                                | 85.1                        |               | 84.9                        |               | 83.0                        |               | 82.3                        |                | 82.0                        |                | 81.1                        |                |
| 20000.0                                | 83.1                        |               | 84.8                        |               | 82.7                        |               | 81.5                        |                | 81.1                        |                | 80.6                        |                |
| 25000.0                                | 83.3                        |               | 83.3                        |               | 82.0                        |               | 80.9                        |                | 80.7                        |                | 80.3                        |                |
| 31500.0                                | 82.6                        |               | 83.4                        |               | 81.7                        |               | 80.3                        |                | 80.3                        |                | 80.1                        |                |
| 40000.0                                | 81.6                        |               | 83.2                        |               | 81.3                        |               | 80.2                        |                | 79.5                        |                | 80.4                        |                |
| OVERALL<br>SPL                         | 98.4                        |               | 97.8                        |               | 96.6                        |               | 95.5                        |                | 94.9                        |                | 94.3                        |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 63.6  |       | 63.4  |       | 64.1  |       | 65.1  |       |  |
| 250.0   | 66.8  |       | 66.2  |       | 66.7  |       | 65.9  |       |  |
| 315.2   | 68.9  |       | 68.1  |       | 67.2  |       | 67.4  |       |  |
| 400.0   | 70.7  |       | 69.3  |       | 69.0  |       | 69.3  |       |  |
| 500.0   | 73.4  |       | 72.2  |       | 71.3  |       | 70.4  |       |  |
| 630.0   | 76.8  |       | 75.4  |       | 73.5  |       | 71.2  |       |  |
| 800.0   | 76.6  |       | 75.6  |       | 74.5  |       | 73.6  |       |  |
| 1000.0  | 77.6  |       | 76.2  |       | 76.1  |       | 74.6  |       |  |
| 1250.0  | 79.2  |       | 78.2  |       | 77.3  |       | 75.4  |       |  |
| 1600.0  | 80.2  |       | 78.8  |       | 77.8  |       | 76.3  |       |  |
| 2000.0  | 81.1  |       | 80.2  |       | 78.8  |       | 76.9  |       |  |
| 2500.0  | 81.8  |       | 80.6  |       | 79.5  |       | 77.3  |       |  |
| 3150.0  | 82.5  |       | 81.4  |       | 79.9  |       | 77.6  |       |  |
| 4000.0  | 83.2  |       | 81.7  |       | 80.3  |       | 78.0  |       |  |
| 5000.0  | 83.1  |       | 81.4  |       | 80.0  |       | 77.6  |       |  |
| 6300.0  | 83.3  |       | 81.7  |       | 80.1  |       | 77.8  |       |  |
| 8000.0  | 82.9  |       | 81.5  |       | 79.4  |       | 77.4  |       |  |
| 10000.0 | 82.6  |       | 80.8  |       | 79.0  |       | 76.6  |       |  |
| 12500.0 | 82.0  |       | 80.6  |       | 77.8  |       | 76.1  |       |  |
| 16000.0 | 81.3  |       | 79.8  |       | 77.0  |       | 74.6  |       |  |
| 20000.0 | 80.6  |       | 78.8  |       | 75.9  |       | 73.4  |       |  |
| 25000.0 | 79.7  |       | 78.0  |       | 75.2  |       | 72.0  |       |  |
| 31500.0 | 79.1  |       | 77.4  |       | 74.5  |       | 70.9  |       |  |
| 40000.0 | 78.6  |       | 77.4  |       | 73.8  |       | 70.0  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 94.0  |       | 92.6  |       | 90.8  |       | 88.7  |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.66 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 641.00 DEG.F, CHAMBER TEMPERATURE = 90.00 DEG.F  
RELATIVE HUMIDITY = 30.0 PERCENT  
GAMMA = 1.373

RUN NUMBER 47

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.610  
TEMPERATURE RATIO TR = 2.002  
MACH NUMBER MJ = 0.860  
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.759$   
JET DENSITY RATIO  $D_J/D_0 = 0.569$   
JET VELOCITY RATIO  $V_J/A_0 = 1.141$   
JET VELOCITY  $V_J = 1311.9$  FPS

TR/TJ = 1.138  
DR/D0 = 0.804  
DR/DJ = 1.415  
MASS FLOW = 1.188 POUNDS PER SECOND  
THRUST = 47.73 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 86.4  |       | 86.0  |       | 81.5  |       |
| 250.0   | 89.0  |       | 89.0  |       | 83.6  |       |
| 315.2   | 93.5  |       | 91.5  |       | 87.3  |       |
| 400.0   | 96.0  |       | 96.6  |       | 91.2  |       |
| 500.0   | 100.1 |       | 98.1  |       | 93.7  |       |
| 630.0   | 99.0  |       | 100.3 |       | 97.4  |       |
| 800.0   | 102.7 |       | 103.8 |       | 100.1 |       |
| 1000.0  | 101.9 |       | 104.7 |       | 103.2 |       |
| 1250.0  | 103.0 |       | 106.7 |       | 105.5 |       |
| 1600.0  | 103.4 |       | 106.6 |       | 106.4 |       |
| 2000.0  | 103.4 |       | 107.1 |       | 106.7 |       |
| 2500.0  | 102.4 |       | 106.4 |       | 105.3 |       |
| 3150.0  | 100.3 |       | 104.5 |       | 103.2 |       |
| 4000.0  | 97.7  |       | 102.1 |       | 102.0 |       |
| 5000.0  | 94.0  |       | 99.1  |       | 99.9  |       |
| 6300.0  | 91.5  |       | 96.9  |       | 98.7  |       |
| 8000.0  | 89.1  |       | 94.5  |       | 97.0  |       |
| 10000.0 | 87.4  |       | 92.6  |       | 95.9  |       |
| 12500.0 | 86.0  |       | 90.9  |       | 94.6  |       |
| 16000.0 | 84.1  |       | 89.4  |       | 93.3  |       |
| 20000.0 | 81.1  |       | 87.1  |       | 91.6  |       |
| 25000.0 | 78.8  |       | 85.5  |       | 90.1  |       |
| 31500.0 | 76.4  |       | 83.3  |       | 87.6  |       |
| 40000.0 | 74.2  |       | 82.3  |       | 85.9  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 112.1 |       | 115.2 |       | 114.3 |       |
|         |       |       |       |       | 113.3 |       |
|         |       |       |       |       |       | 111.3 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 72.8                | 73.6                | 72.7                | 71.8                 | 71.8                 | 71.3                 |
| 250.0                   | 75.9                | 74.7                | 74.5                | 73.5                 | 73.9                 | 73.1                 |
| 315.2                   | 78.5                | 77.6                | 77.4                | 76.5                 | 76.2                 | 75.8                 |
| 400.0                   | 81.9                | 80.2                | 79.0                | 78.7                 | 78.9                 | 77.0                 |
| 500.0                   | 83.9                | 82.2                | 81.4                | 80.2                 | 80.1                 | 79.3                 |
| 630.0                   | 87.3                | 85.0                | 83.8                | 82.9                 | 82.6                 | 81.5                 |
| 800.0                   | 90.1                | 87.5                | 86.0                | 85.0                 | 84.5                 | 83.7                 |
| 1000.0                  | 92.5                | 89.9                | 88.2                | 86.9                 | 86.3                 | 85.2                 |
| 1250.0                  | 94.6                | 92.1                | 90.2                | 88.9                 | 88.1                 | 87.2                 |
| 1600.0                  | 96.2                | 93.6                | 91.4                | 90.2                 | 89.4                 | 88.3                 |
| 2000.0                  | 97.3                | 95.0                | 93.2                | 91.5                 | 90.5                 | 89.2                 |
| 2500.0                  | 98.2                | 95.8                | 93.8                | 92.3                 | 91.3                 | 90.1                 |
| 3150.0                  | 98.7                | 96.7                | 94.6                | 93.3                 | 92.3                 | 91.3                 |
| 4000.0                  | 99.1                | 97.7                | 95.5                | 94.0                 | 93.1                 | 92.0                 |
| 5000.0                  | 99.4                | 97.9                | 95.7                | 94.3                 | 93.5                 | 92.3                 |
| 6300.0                  | 99.4                | 98.1                | 95.8                | 94.7                 | 93.7                 | 92.8                 |
| 8000.0                  | 98.6                | 97.7                | 95.5                | 94.1                 | 93.6                 | 92.7                 |
| 10000.0                 | 98.5                | 97.8                | 95.3                | 94.2                 | 93.5                 | 93.0                 |
| 12500.0                 | 97.8                | 97.4                | 95.1                | 93.9                 | 93.2                 | 92.9                 |
| 16000.0                 | 97.1                | 97.1                | 95.2                | 93.3                 | 93.1                 | 92.5                 |
| 20000.0                 | 96.0                | 95.9                | 94.2                | 92.4                 | 92.1                 | 91.2                 |
| 25000.0                 | 94.9                | 95.0                | 93.8                | 91.5                 | 91.5                 | 90.3                 |
| 31500.0                 | 92.9                | 93.4                | 92.6                | 89.9                 | 90.2                 | 88.8                 |
| 40000.0                 | 91.3                | 92.4                | 91.5                | 88.3                 | 89.5                 | 87.5                 |
| OVERALL<br>SPL          | 109.6               | 108.4               | 106.5               | 104.9                | 104.3                | 103.4                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.54 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 608.00 DEG.F, CHAMBER TEMPERATURE = 55.00 DEG.F  
RELATIVE HUMIDITY = 64.0 PERCENT  
GAMMA = 1.373

RUN NUMBER 148

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.610$   
TEMPERATURE RATIO  $TR = 2.074$   
MACH NUMBER  $MJ = 0.861$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.322$   
JET DENSITY RATIO  $DJ/DO = 0.549$   
JET VELOCITY RATIO  $VJ/AO = 1.162$   
JET VELOCITY  $VJ = 1292.2$  FPS

$TR/TJ = 1.138$   
 $DR/DO = 0.776$   
 $DR/DJ = 1.415$   
MASS FLOW = 1.167 POUNDS PER SECOND  
THRUST = 47.74 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 69.4                        | 71.3                        | 71.0                        | 70.6                        | 69.3                        | 67.5                        |
| 250.0                                  | 72.2                        | 72.7                        | 71.0                        | 70.8                        | 70.8                        | 70.9                        |
| 315.2                                  | 73.9                        | 74.4                        | 73.9                        | 74.4                        | 74.2                        | 73.8                        |
| 400.0                                  | 77.6                        | 77.4                        | 77.0                        | 76.1                        | 76.0                        | 75.4                        |
| 500.0                                  | 79.9                        | 79.7                        | 79.8                        | 79.3                        | 78.7                        | 78.6                        |
| 630.0                                  | 82.6                        | 82.7                        | 81.8                        | 81.8                        | 81.0                        | 81.6                        |
| 800.0                                  | 85.4                        | 84.9                        | 84.0                        | 82.8                        | 82.0                        | 82.2                        |
| 1000.0                                 | 88.1                        | 86.8                        | 84.9                        | 84.0                        | 83.1                        | 82.4                        |
| 1250.0                                 | 90.1                        | 88.4                        | 87.2                        | 86.4                        | 85.4                        | 84.6                        |
| 1600.0                                 | 91.4                        | 89.3                        | 88.2                        | 87.3                        | 86.5                        | 86.2                        |
| 2000.0                                 | 92.4                        | 90.8                        | 89.6                        | 88.7                        | 87.5                        | 87.1                        |
| 2500.0                                 | 92.7                        | 91.4                        | 90.2                        | 89.6                        | 88.5                        | 87.9                        |
| 3150.0                                 | 93.8                        | 92.4                        | 91.1                        | 90.4                        | 89.3                        | 88.7                        |
| 4000.0                                 | 94.1                        | 92.9                        | 91.6                        | 90.7                        | 89.9                        | 88.9                        |
| 5000.0                                 | 93.9                        | 93.1                        | 92.0                        | 90.7                        | 90.1                        | 89.2                        |
| 6300.0                                 | 94.0                        | 94.1                        | 92.3                        | 91.3                        | 90.6                        | 89.8                        |
| 8000.0                                 | 94.1                        | 94.6                        | 91.4                        | 90.9                        | 90.1                        | 89.0                        |
| 10000.0                                | 94.4                        | 94.0                        | 92.0                        | 90.4                        | 90.1                        | 88.8                        |
| 12500.0                                | 94.4                        | 92.9                        | 91.6                        | 90.2                        | 89.8                        | 88.5                        |
| 16000.0                                | 92.8                        | 92.4                        | 90.2                        | 89.3                        | 88.9                        | 87.7                        |
| 20000.0                                | 90.9                        | 92.4                        | 89.9                        | 88.6                        | 88.1                        | 87.1                        |
| 25000.0                                | 90.9                        | 91.0                        | 89.3                        | 87.9                        | 87.6                        | 86.8                        |
| 31500.0                                | 90.2                        | 91.1                        | 88.8                        | 87.2                        | 87.1                        | 86.5                        |
| 40000.0                                | 88.9                        | 90.8                        | 86.3                        | 87.2                        | 86.2                        | 86.6                        |
| OVERALL<br>SPL                         | 105.0                       | 104.5                       | 102.7                       | 101.7                       | 101.0                       | 100.2                       |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

|        |           |           |           |           |
|--------|-----------|-----------|-----------|-----------|
| 1/3    |           |           |           |           |
| OCTAVE | MICRO     | MICRO     | MICRO     | MICRO     |
| CENTER | PHONE     | PHONE     | PHONE     | PHONE     |
| FREQ.  | NO. ANGLE | NO. ANGLE | NO. ANGLE | NO. ANGLE |
| HZ     | 16 127.5  | 17 135.0  | 18 142.5  | 19 150.0  |

|         |      |      |      |      |
|---------|------|------|------|------|
| 200.0   | 66.5 | 66.6 | 68.3 | 69.6 |
| 250.0   | 69.9 | 70.4 | 70.7 | 71.0 |
| 315.2   | 72.3 | 71.4 | 71.5 | 72.7 |
| 400.0   | 74.3 | 73.7 | 73.6 | 74.6 |
| 500.0   | 77.9 | 76.7 | 76.5 | 75.5 |
| 630.0   | 82.2 | 81.0 | 79.0 | 76.4 |
| 800.0   | 81.5 | 80.9 | 80.1 | 78.6 |
| 1000.0  | 82.0 | 81.0 | 80.8 | 80.1 |
| 1250.0  | 83.7 | 83.4 | 82.7 | 81.0 |
| 1600.0  | 84.9 | 84.1 | 83.6 | 82.5 |
| 2000.0  | 86.4 | 85.8 | 84.9 | 83.3 |
| 2500.0  | 86.9 | 86.2 | 85.5 | 84.1 |
| 3150.0  | 88.0 | 87.2 | 86.5 | 84.8 |
| 4000.0  | 88.7 | 87.7 | 87.0 | 85.3 |
| 5000.0  | 88.7 | 87.4 | 86.9 | 85.2 |
| 6300.0  | 89.5 | 87.7 | 87.2 | 85.8 |
| 8000.0  | 89.0 | 88.1 | 86.6 | 85.3 |
| 10000.0 | 89.0 | 87.6 | 86.2 | 84.7 |
| 12500.0 | 88.4 | 87.5 | 85.8 | 83.9 |
| 16000.0 | 87.7 | 86.7 | 85.0 | 82.4 |
| 20000.0 | 87.0 | 85.6 | 83.9 | 81.0 |
| 25000.0 | 86.3 | 84.7 | 83.1 | 79.6 |
| 31500.0 | 85.5 | 84.0 | 82.4 | 78.4 |
| 40000.0 | 85.0 | 83.9 | 81.7 | 77.3 |

|         |      |      |      |      |
|---------|------|------|------|------|
| OVERALL |      |      |      |      |
| SPL     | 99.8 | 98.7 | 97.6 | 95.8 |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 12.00 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 681.00 DEG.F, CHAMBER TEMPERATURE = 91.00 DEG.F  
RELATIVE HUMIDITY = 30.0 PERCENT  
GAMMA = 1.370

RUN NUMBER 48

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.845$   
TEMPERATURE RATIO  $TR = 2.071$   
MACH NUMBER  $MJ = 0.986$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.755$   
JET DENSITY RATIO  $\rho J/\rho_0 = 0.570$   
JET VELOCITY RATIO  $VJ/A_0 = 1.306$   
JET VELOCITY  $VJ = 1503.2$  FPS

$TR/TJ = 1.180$   
 $DR/\rho_0 = 0.891$   
 $DR/\rho J = 1.564$   
MASS FLOW = 1.363 POUNDS PER SECOND  
THRUST = 62.68 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 91.0                                  | 89.3                                  | 84.6                                  | 82.6                                  | 80.9                                  | 78.4                                  |
| 250.0                                  | 93.9                                  | 92.8                                  | 91.0                                  | 87.2                                  | 84.9                                  | 81.2                                  |
| 315.2                                  | 98.3                                  | 95.5                                  | 95.7                                  | 91.0                                  | 87.1                                  | 84.8                                  |
| 400.0                                  | 100.1                                 | 100.4                                 | 98.0                                  | 95.0                                  | 91.7                                  | 88.6                                  |
| 500.0                                  | 103.4                                 | 102.4                                 | 101.4                                 | 97.7                                  | 94.3                                  | 91.0                                  |
| 630.0                                  | 102.6                                 | 105.0                                 | 104.8                                 | 101.3                                 | 98.2                                  | 94.2                                  |
| 800.0                                  | 107.0                                 | 108.4                                 | 107.7                                 | 104.2                                 | 101.2                                 | 97.5                                  |
| 1000.0                                 | 105.6                                 | 108.9                                 | 109.9                                 | 107.3                                 | 104.3                                 | 100.4                                 |
| 1250.0                                 | 107.6                                 | 110.2                                 | 112.1                                 | 110.2                                 | 107.4                                 | 103.0                                 |
| 1600.0                                 | 107.9                                 | 111.0                                 | 112.6                                 | 111.4                                 | 108.9                                 | 105.0                                 |
| 2000.0                                 | 108.8                                 | 111.9                                 | 113.1                                 | 112.4                                 | 110.1                                 | 106.3                                 |
| 2500.0                                 | 108.8                                 | 112.4                                 | 113.5                                 | 112.2                                 | 109.8                                 | 106.2                                 |
| 3150.0                                 | 108.6                                 | 112.3                                 | 113.2                                 | 111.3                                 | 108.8                                 | 106.4                                 |
| 4000.0                                 | 108.2                                 | 111.7                                 | 112.2                                 | 109.9                                 | 108.2                                 | 106.4                                 |
| 5000.0                                 | 105.9                                 | 109.4                                 | 109.7                                 | 107.7                                 | 106.7                                 | 105.9                                 |
| 6300.0                                 | 104.1                                 | 107.5                                 | 107.4                                 | 106.0                                 | 105.6                                 | 105.5                                 |
| 8000.0                                 | 101.6                                 | 105.1                                 | 105.1                                 | 104.3                                 | 104.2                                 | 104.5                                 |
| 10000.0                                | 99.4                                  | 102.9                                 | 103.0                                 | 103.0                                 | 103.1                                 | 104.1                                 |
| 12500.0                                | 96.9                                  | 100.5                                 | 101.0                                 | 101.5                                 | 102.1                                 | 103.2                                 |
| 16000.0                                | 94.6                                  | 98.3                                  | 99.1                                  | 100.3                                 | 101.0                                 | 102.3                                 |
| 20000.0                                | 91.4                                  | 95.6                                  | 97.0                                  | 98.5                                  | 99.3                                  | 101.2                                 |
| 25000.0                                | 89.0                                  | 93.8                                  | 95.3                                  | 97.0                                  | 97.9                                  | 100.3                                 |
| 31500.0                                | 86.4                                  | 91.8                                  | 92.9                                  | 94.7                                  | 95.8                                  | 98.8                                  |
| 40000.0                                | 84.8                                  | 91.0                                  | 90.9                                  | 93.2                                  | 93.6                                  | 97.5                                  |
| OVERALL<br>SPL                         | 118.2                                 | 121.2                                 | 122.0                                 | 120.4                                 | 118.5                                 | 116.5                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 75.8                                  | 76.1                                  | 75.6                                  | 74.6                                   | 74.4                                   | 74.2                                   |
| 250.0                                  | 78.6                                  | 77.8                                  | 77.4                                  | 76.4                                   | 76.8                                   | 75.9                                   |
| 315.2                                  | 82.0                                  | 80.1                                  | 79.5                                  | 79.2                                   | 78.5                                   | 77.8                                   |
| 400.0                                  | 85.4                                  | 82.1                                  | 82.3                                  | 81.2                                   | 81.4                                   | 80.1                                   |
| 500.0                                  | 87.3                                  | 84.3                                  | 83.6                                  | 82.3                                   | 82.3                                   | 80.8                                   |
| 630.0                                  | 90.4                                  | 87.0                                  | 86.3                                  | 85.4                                   | 85.0                                   | 84.1                                   |
| 800.0                                  | 93.5                                  | 90.1                                  | 88.7                                  | 87.4                                   | 87.0                                   | 86.8                                   |
| 1000.0                                 | 95.7                                  | 92.0                                  | 90.5                                  | 89.7                                   | 88.4                                   | 87.9                                   |
| 1250.0                                 | 98.1                                  | 94.5                                  | 92.7                                  | 91.8                                   | 90.6                                   | 90.2                                   |
| 1600.0                                 | 100.4                                 | 96.1                                  | 94.3                                  | 93.0                                   | 92.1                                   | 91.2                                   |
| 2000.0                                 | 101.8                                 | 97.7                                  | 95.9                                  | 94.4                                   | 93.4                                   | 92.6                                   |
| 2500.0                                 | 102.4                                 | 98.7                                  | 96.8                                  | 95.6                                   | 94.5                                   | 93.5                                   |
| 3150.0                                 | 103.3                                 | 99.7                                  | 97.8                                  | 96.6                                   | 95.5                                   | 94.5                                   |
| 4000.0                                 | 104.0                                 | 100.8                                 | 98.9                                  | 97.4                                   | 96.2                                   | 95.3                                   |
| 5000.0                                 | 104.2                                 | 101.0                                 | 98.7                                  | 97.7                                   | 96.5                                   | 95.7                                   |
| 6300.0                                 | 104.2                                 | 101.5                                 | 99.1                                  | 98.3                                   | 96.8                                   | 96.3                                   |
| 8000.0                                 | 103.8                                 | 101.2                                 | 99.0                                  | 98.0                                   | 96.6                                   | 96.3                                   |
| 10000.0                                | 103.5                                 | 101.3                                 | 98.9                                  | 98.2                                   | 96.6                                   | 96.5                                   |
| 12500.0                                | 102.9                                 | 100.8                                 | 98.8                                  | 97.9                                   | 96.3                                   | 96.2                                   |
| 16000.0                                | 102.2                                 | 100.7                                 | 98.9                                  | 97.6                                   | 96.3                                   | 96.0                                   |
| 20000.0                                | 101.1                                 | 99.7                                  | 98.1                                  | 96.7                                   | 95.3                                   | 94.9                                   |
| 25000.0                                | 100.0                                 | 99.0                                  | 97.7                                  | 96.1                                   | 94.7                                   | 94.1                                   |
| 31500.0                                | 98.2                                  | 97.6                                  | 96.4                                  | 94.5                                   | 93.4                                   | 92.6                                   |
| 40000.0                                | 96.6                                  | 96.8                                  | 95.2                                  | 93.2                                   | 92.8                                   | 91.4                                   |
| OVERALL<br>SPL                         | 114.4                                 | 111.8                                 | 109.8                                 | 108.7                                  | 107.4                                  | 106.8                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 11.84 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 645.00 DEG.F, CHAMBER TEMPERATURE = 54.00 DEG.F  
RELATIVE HUMIDITY = 65.0 PERCENT  
GAMMA = 1.370

RUN NUMBER 149

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.846$   
TEMPERATURE RATIO  $T_r = 2.150$   
MACH NUMBER  $M_J = 0.986$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.822$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.549$   
JET VELOCITY RATIO  $V_J/A_0 = 1.331$   
JET VELOCITY  $V_J = 1479.6$  FPS

$T_r/T_J = 1.180$   
 $D_r/D_0 = 0.859$   
 $D_r/D_J = 1.564$   
MASS FLOW = 1.338 POUNDS PER SECOND  
THRUST = 62.72 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

100

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16 | ANGLE<br>127.5 | MICRO<br>PHONE<br>NO. 17 | ANGLE<br>135.0 | MICRO<br>PHONE<br>NO. 18 | ANGLE<br>142.5 | MICRO<br>PHONE<br>NO. 19 | ANGLE<br>150.0 |
|--|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|
| 200.0                                  | 58.5                     |                | 58.8                     |                | 60.5                     |                | 61.0                     |                |
| 250.0                                  | 62.5                     |                | 62.3                     |                | 62.7                     |                | 62.7                     |                |
| 315.2                                  | 65.4                     |                | 64.2                     |                | 63.3                     |                | 64.5                     |                |
| 400.0                                  | 67.2                     |                | 66.2                     |                | 65.5                     |                | 66.0                     |                |
| 500.0                                  | 71.4                     |                | 70.5                     |                | 69.4                     |                | 67.8                     |                |
| 630.0                                  | 75.4                     |                | 74.4                     |                | 71.7                     |                | 67.8                     |                |
| 800.0                                  | 74.9                     |                | 73.9                     |                | 73.1                     |                | 70.8                     |                |
| 1000.0                                 | 75.4                     |                | 73.7                     |                | 73.5                     |                | 72.1                     |                |
| 1250.0                                 | 76.6                     |                | 76.3                     |                | 76.1                     |                | 73.4                     |                |
| 1600.0                                 | 77.7                     |                | 77.2                     |                | 76.7                     |                | 75.3                     |                |
| 2000.0                                 | 79.0                     |                | 78.8                     |                | 78.0                     |                | 75.9                     |                |
| 2500.0                                 | 80.0                     |                | 79.5                     |                | 78.7                     |                | 77.1                     |                |
| 3150.0                                 | 80.8                     |                | 80.4                     |                | 79.5                     |                | 77.9                     |                |
| 4000.0                                 | 81.8                     |                | 81.1                     |                | 80.3                     |                | 78.3                     |                |
| 5000.0                                 | 82.1                     |                | 80.9                     |                | 80.4                     |                | 78.8                     |                |
| 6300.0                                 | 82.7                     |                | 81.9                     |                | 81.0                     |                | 79.6                     |                |
| 8000.0                                 | 82.6                     |                | 82.0                     |                | 80.9                     |                | 79.5                     |                |
| 10000.0                                | 82.3                     |                | 81.5                     |                | 80.3                     |                | 78.8                     |                |
| 12500.0                                | 82.1                     |                | 81.3                     |                | 80.0                     |                | 78.2                     |                |
| 16000.0                                | 81.5                     |                | 80.4                     |                | 79.0                     |                | 76.6                     |                |
| 20000.0                                | 80.7                     |                | 79.5                     |                | 77.9                     |                | 75.0                     |                |
| 25000.0                                | 80.0                     |                | 78.6                     |                | 77.0                     |                | 73.6                     |                |
| 31500.0                                | 79.3                     |                | 77.9                     |                | 76.3                     |                | 72.3                     |                |
| 40000.0                                | 78.8                     |                | 77.7                     |                | 75.5                     |                | 71.4                     |                |
| OVERALL<br>SPL                         | 93.1                     |                | 92.3                     |                | 91.2                     |                | 89.3                     |                |

Note: All sound pressure levels printed on this page are 10 dB lower than the actual levels. To obtain correct levels, add 10 dB to all sound pressure levels printed above.

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.53 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 761.00 DEG.F, CHAMBER TEMPERATURE = 80.00 DEG.F  
RELATIVE HUMIDITY = 52.0 PERCENT  
GAMMA = 1.365

RUN NUMBER 28

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.037$   
TEMPERATURE RATIO  $TR = 2.261$   
MACH NUMBER  $MJ = 0.232$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.239$   
JET DENSITY RATIO  $DJ/D_0 = 0.447$   
JET VELOCITY RATIO  $VJ/A_0 = 0.348$   
JET VELOCITY  $VJ = 396.2$  FPS

$TR/TJ = 1.010$   
 $DR/D_0 = 0.459$   
 $DR/DJ = 1.027$   
MASS FLOW = 0.284 POUNDS PER SECOND  
THRUST = 3.48 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 59.0                                  | 57.3                                  | 56.0                                  | 54.6                                  | 54.9                                  | 52.7                                  |
| 250.0                                  | 60.8                                  | 60.2                                  | 60.5                                  | 58.5                                  | 57.7                                  | 55.5                                  |
| 315.2                                  | 64.7                                  | 63.3                                  | 64.2                                  | 61.5                                  | 61.8                                  | 59.0                                  |
| 400.0                                  | 66.6                                  | 66.9                                  | 64.6                                  | 63.3                                  | 63.7                                  | 61.0                                  |
| 500.0                                  | 67.9                                  | 66.0                                  | 65.4                                  | 63.9                                  | 63.9                                  | 62.2                                  |
| 630.0                                  | 64.3                                  | 65.5                                  | 66.3                                  | 64.3                                  | 64.2                                  | 62.4                                  |
| 800.0                                  | 66.4                                  | 66.7                                  | 65.8                                  | 64.6                                  | 64.7                                  | 62.8                                  |
| 1000.0                                 | 63.8                                  | 64.7                                  | 65.5                                  | 64.3                                  | 64.6                                  | 63.2                                  |
| 1250.0                                 | 62.6                                  | 64.8                                  | 65.3                                  | 64.4                                  | 64.8                                  | 63.0                                  |
| 1600.0                                 | 59.4                                  | 62.2                                  | 63.6                                  | 63.0                                  | 63.7                                  | 62.5                                  |
| 2000.0                                 | 57.0                                  | 60.3                                  | 62.2                                  | 62.3                                  | 63.2                                  | 62.0                                  |
| 2500.0                                 | 54.8                                  | 58.0                                  | 60.1                                  | 60.6                                  | 61.9                                  | 61.2                                  |
| 3150.0                                 | 52.0                                  | 55.5                                  | 58.0                                  | 59.4                                  | 60.5                                  | 60.4                                  |
| 4000.0                                 | 53.0                                  | 54.4                                  | 56.2                                  | 58.1                                  | 59.8                                  | 59.4                                  |
| 5000.0                                 | 52.7                                  | 53.8                                  | 54.7                                  | 56.2                                  | 58.7                                  | 58.9                                  |
| 6300.0                                 | 51.9                                  | 52.1                                  | 53.0                                  | 55.0                                  | 57.6                                  | 57.8                                  |
| 8000.0                                 | 51.6                                  | 50.6                                  | 51.7                                  | 53.6                                  | 56.1                                  | 56.5                                  |
| 10000.0                                | 52.0                                  | 48.7                                  | 50.3                                  | 52.8                                  | 55.5                                  | 55.9                                  |
| 12500.0                                | 49.8                                  | 49.1                                  | 50.2                                  | 52.0                                  | 54.9                                  | 55.3                                  |
| 16000.0                                | 48.3                                  | 48.9                                  | 49.3                                  | 51.3                                  | 54.4                                  | 54.6                                  |
| 20000.0                                | 46.9                                  | 48.4                                  | 48.9                                  | 50.8                                  | 53.7                                  | 53.8                                  |
| 25000.0                                | 47.6                                  | 49.2                                  | 49.0                                  | 50.2                                  | 53.3                                  | 53.4                                  |
| 31500.0                                | 49.6                                  | 51.5                                  | 49.6                                  | 50.5                                  | 53.8                                  | 53.3                                  |
| 40000.0                                | 52.2                                  | 54.3                                  | 51.4                                  | 52.5                                  | 56.7                                  | 53.6                                  |
| OVERALL<br>SPL                         | 74.8                                  | 75.1                                  | 75.2                                  | 74.2                                  | 74.9                                  | 73.5                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 53.0                                  | 53.6                                  | 51.5                                  | 52.9                                   | 54.0                                   | 53.2                                   |
| 250.0                                  | 54.8                                  | 54.2                                  | 52.9                                  | 52.6                                   | 54.1                                   | 52.8                                   |
| 315.2                                  | 57.8                                  | 57.5                                  | 56.2                                  | 55.9                                   | 56.1                                   | 55.5                                   |
| 400.0                                  | 60.2                                  | 58.9                                  | 57.6                                  | 57.2                                   | 56.7                                   | 55.8                                   |
| 500.0                                  | 60.6                                  | 59.7                                  | 58.6                                  | 58.0                                   | 58.6                                   | 56.6                                   |
| 630.0                                  | 61.4                                  | 60.2                                  | 59.5                                  | 58.8                                   | 58.9                                   | 57.6                                   |
| 800.0                                  | 62.0                                  | 60.8                                  | 60.4                                  | 59.4                                   | 59.7                                   | 58.4                                   |
| 1000.0                                 | 62.4                                  | 61.2                                  | 60.7                                  | 59.8                                   | 59.9                                   | 58.5                                   |
| 1250.0                                 | 62.1                                  | 61.6                                  | 60.9                                  | 60.1                                   | 60.6                                   | 59.2                                   |
| 1600.0                                 | 61.9                                  | 60.9                                  | 60.5                                  | 59.6                                   | 60.0                                   | 58.6                                   |
| 2000.0                                 | 61.4                                  | 60.8                                  | 60.2                                  | 59.5                                   | 59.9                                   | 58.7                                   |
| 2500.0                                 | 60.6                                  | 59.9                                  | 59.9                                  | 58.7                                   | 59.4                                   | 58.2                                   |
| 3150.0                                 | 59.9                                  | 59.5                                  | 59.1                                  | 58.4                                   | 59.2                                   | 57.9                                   |
| 4000.0                                 | 59.1                                  | 58.8                                  | 58.7                                  | 57.7                                   | 58.6                                   | 57.3                                   |
| 5000.0                                 | 58.5                                  | 58.3                                  | 57.9                                  | 57.3                                   | 58.4                                   | 57.3                                   |
| 6300.0                                 | 57.8                                  | 57.7                                  | 57.3                                  | 56.9                                   | 58.1                                   | 57.0                                   |
| 8000.0                                 | 57.1                                  | 57.0                                  | 56.8                                  | 56.2                                   | 57.6                                   | 56.3                                   |
| 10000.0                                | 56.7                                  | 56.6                                  | 56.2                                  | 56.3                                   | 57.2                                   | 56.1                                   |
| 12500.0                                | 56.3                                  | 56.2                                  | 56.0                                  | 55.5                                   | 57.2                                   | 56.1                                   |
| 16000.0                                | 55.9                                  | 56.0                                  | 56.0                                  | 55.1                                   | 57.3                                   | 55.8                                   |
| 20000.0                                | 55.5                                  | 55.4                                  | 55.6                                  | 54.5                                   | 56.8                                   | 54.9                                   |
| 25000.0                                | 55.4                                  | 55.0                                  | 55.4                                  | 53.9                                   | 56.5                                   | 54.2                                   |
| 31500.0                                | 55.5                                  | 54.4                                  | 54.8                                  | 53.5                                   | 56.0                                   | 53.5                                   |
| 40000.0                                | 56.9                                  | 54.4                                  | 54.7                                  | 53.5                                   | 56.2                                   | 53.4                                   |
| OVERALL<br>SPL                         | 73.0                                  | 72.3                                  | 71.8                                  | 71.1                                   | 71.9                                   | 70.6                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.52 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 715.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.365

RUN NUMBER 218

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.037$   
TEMPERATURE RATIO  $TR = 2.260$   
MACH NUMBER  $MJ = 0.230$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 2.238$   
JET DENSITY RATIO  $DJ/DO = 0.447$   
JET VELOCITY RATIO  $VJ/AO = 0.344$   
JET VELOCITY  $VJ = 385.1$  FPS

$TR/TJ = 1.010$   
 $DR/DO = 0.459$   
 $DR/DJ = 1.027$   
MASS FLOW = 0.282 POUNDS PER SECOND  
THRUST = 3.42 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  | 13    | 105.0 | 14    | 112.5 | 15    | 120.0 |  |
| 200.0   | 54.2  |       | 56.4  |       | 57.2  |       | 54.9  |       | 53.5  |       | 54.7  |       |  |
| 250.0   | 57.2  |       | 58.8  |       | 58.2  |       | 55.6  |       | 55.8  |       | 56.0  |       |  |
| 315.2   | 60.6  |       | 60.2  |       | 59.6  |       | 58.7  |       | 59.0  |       | 58.6  |       |  |
| 400.0   | 61.7  |       | 60.3  |       | 60.4  |       | 58.8  |       | 59.3  |       | 59.0  |       |  |
| 500.0   | 60.3  |       | 58.6  |       | 59.0  |       | 58.7  |       | 58.4  |       | 57.4  |       |  |
| 630.0   | 61.4  |       | 60.1  |       | 59.4  |       | 58.9  |       | 58.9  |       | 58.6  |       |  |
| 800.0   | 62.2  |       | 61.2  |       | 60.7  |       | 60.1  |       | 59.9  |       | 59.4  |       |  |
| 1000.0  | 61.7  |       | 60.3  |       | 59.8  |       | 59.7  |       | 59.2  |       | 58.6  |       |  |
| 1250.0  | 61.3  |       | 60.1  |       | 60.0  |       | 59.5  |       | 58.7  |       | 58.3  |       |  |
| 1600.0  | 60.5  |       | 59.8  |       | 59.4  |       | 58.8  |       | 58.6  |       | 57.7  |       |  |
| 2000.0  | 60.0  |       | 59.4  |       | 59.5  |       | 58.7  |       | 58.4  |       | 58.1  |       |  |
| 2500.0  | 59.2  |       | 58.7  |       | 58.5  |       | 58.2  |       | 58.0  |       | 57.4  |       |  |
| 3150.0  | 58.8  |       | 58.0  |       | 58.0  |       | 57.9  |       | 57.7  |       | 57.2  |       |  |
| 4000.0  | 58.1  |       | 57.5  |       | 57.7  |       | 57.5  |       | 57.5  |       | 56.6  |       |  |
| 5000.0  | 57.1  |       | 56.9  |       | 57.6  |       | 57.0  |       | 57.4  |       | 56.5  |       |  |
| 6300.0  | 56.8  |       | 57.7  |       | 57.4  |       | 57.4  |       | 57.6  |       | 56.6  |       |  |
| 8000.0  | 56.9  |       | 57.3  |       | 55.9  |       | 56.4  |       | 56.7  |       | 55.9  |       |  |
| 10000.0 | 57.2  |       | 56.9  |       | 55.6  |       | 55.8  |       | 56.1  |       | 55.4  |       |  |
| 12500.0 | 57.4  |       | 55.6  |       | 55.9  |       | 55.5  |       | 55.8  |       | 55.0  |       |  |
| 16000.0 | 56.6  |       | 55.9  |       | 55.0  |       | 55.2  |       | 55.6  |       | 54.6  |       |  |
| 20000.0 | 55.0  |       | 55.9  |       | 55.4  |       | 54.9  |       | 55.1  |       | 54.3  |       |  |
| 25000.0 | 55.0  |       | 54.5  |       | 54.8  |       | 54.4  |       | 54.5  |       | 53.9  |       |  |
| 31500.0 | 55.1  |       | 54.6  |       | 54.5  |       | 54.1  |       | 54.1  |       | 53.7  |       |  |
| 40000.0 | 54.0  |       | 54.0  |       | 54.3  |       | 54.6  |       | 53.4  |       | 54.5  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |       |       |       |       |  |
| SPL     | 72.8  |       | 72.1  |       | 71.9  |       | 71.3  |       | 71.2  |       | 70.7  |       |  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 |
|         |       |       | 18    | 142.5 |
|         |       |       | 19    | 150.0 |
| 200.0   | 55.2  |       | 57.3  | 54.7  |
| 250.0   | 56.7  |       | 54.8  | 56.1  |
| 315.2   | 59.3  |       | 57.9  | 57.4  |
| 400.0   | 58.5  |       | 58.1  | 57.4  |
| 500.0   | 57.9  |       | 57.4  | 57.1  |
| 630.0   | 58.7  |       | 57.7  | 56.9  |
| 800.0   | 59.6  |       | 58.6  | 57.5  |
| 1000.0  | 58.8  |       | 58.3  | 56.5  |
| 1250.0  | 58.3  |       | 57.1  | 55.2  |
| 1600.0  | 57.7  |       | 56.1  | 54.9  |
| 2000.0  | 57.7  |       | 56.3  | 54.4  |
| 2500.0  | 57.5  |       | 56.0  | 54.1  |
| 3150.0  | 57.3  |       | 55.8  | 53.8  |
| 4000.0  | 56.9  |       | 55.7  | 53.6  |
| 5000.0  | 56.8  |       | 54.8  | 52.7  |
| 6300.0  | 56.6  |       | 54.5  | 52.2  |
| 8000.0  | 56.0  |       | 53.9  | 51.0  |
| 10000.0 | 55.2  |       | 52.9  | 50.1  |
| 12500.0 | 54.6  |       | 52.1  | 49.0  |
| 16000.0 | 54.4  |       | 51.1  | 48.4  |
| 20000.0 | 54.1  |       | 49.9  | 47.5  |
| 25000.0 | 52.5  |       | 48.3  | 45.3  |
| 31500.0 | 51.7  |       | 47.0  | 43.8  |
| 40000.0 | 51.0  |       | 46.8  | 43.2  |
| OVERALL |       |       |       |       |
| SPL     | 70.7  |       | 69.4  | 68.0  |
|         |       |       |       | 67.3  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.70 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 765.00 DEG.F, CHAMBER TEMPERATURE = 99.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.365

RUN NUMBER 49

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.049$   
TEMPERATURE RATIO  $TR = 2.191$   
MACH NUMBER  $MJ = 0.266$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.163$   
JET DENSITY RATIO  $DJ/D_0 = 0.462$   
JET VELOCITY RATIO  $VJ/A_0 = 0.392$   
JET VELOCITY  $VJ = 454.1$  FPS

$TR/TJ = 1.013$   
 $DR/D_0 = 0.479$   
 $DR/DJ = 1.036$   
MASS FLOW = 0.332 POUNDS PER SECOND  
THRUST = 4.57 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 61.4  |       | 60.5  |       | 58.8  |       |
| 250.0   | 64.1  |       | 64.3  |       | 63.4  |       |
| 315.2   | 67.4  |       | 66.4  |       | 66.1  |       |
| 400.0   | 69.4  |       | 69.9  |       | 67.0  |       |
| 500.0   | 71.7  |       | 70.0  |       | 69.0  |       |
| 630.0   | 69.0  |       | 69.6  |       | 69.9  |       |
| 800.0   | 70.8  |       | 71.3  |       | 70.2  |       |
| 1000.0  | 67.8  |       | 69.0  |       | 69.8  |       |
| 1250.0  | 66.4  |       | 68.2  |       | 69.0  |       |
| 1600.0  | 63.2  |       | 65.8  |       | 67.2  |       |
| 2000.0  | 61.2  |       | 64.1  |       | 66.0  |       |
| 2500.0  | 58.2  |       | 61.4  |       | 64.0  |       |
| 3150.0  | 55.3  |       | 59.2  |       | 61.8  |       |
| 4000.0  | 56.2  |       | 58.3  |       | 60.1  |       |
| 5000.0  | 55.3  |       | 57.2  |       | 58.1  |       |
| 6300.0  | 54.9  |       | 55.4  |       | 56.3  |       |
| 8000.0  | 54.9  |       | 54.2  |       | 55.4  |       |
| 10000.0 | 54.4  |       | 52.3  |       | 54.6  |       |
| 12500.0 | 53.6  |       | 52.8  |       | 53.4  |       |
| 16000.0 | 51.6  |       | 52.1  |       | 52.7  |       |
| 20000.0 | 48.7  |       | 50.2  |       | 51.5  |       |
| 25000.0 | 48.1  |       | 50.2  |       | 51.0  |       |
| 31500.0 | 48.3  |       | 51.0  |       | 50.2  |       |
| 40000.0 | 50.2  |       | 53.1  |       | 50.7  |       |
|         |       |       |       |       | 51.3  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 78.5  |       | 78.8  |       | 78.7  |       |
|         |       |       |       |       | 77.7  |       |
|         |       |       |       |       | 78.3  |       |
|         |       |       |       |       |       | 77.3  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 55.0                | 55.0                | 54.4                | 53.6                 | 54.1                 | 55.0                 |
| 250.0                   | 57.6                | 56.5                | 55.9                | 55.8                 | 55.8                 | 55.0                 |
| 315.2                   | 59.9                | 58.2                | 57.4                | 58.2                 | 56.9                 | 57.8                 |
| 400.0                   | 62.5                | 60.7                | 59.5                | 59.8                 | 58.4                 | 58.0                 |
| 500.0                   | 63.7                | 62.3                | 61.0                | 60.8                 | 60.0                 | 59.8                 |
| 630.0                   | 64.6                | 63.3                | 62.3                | 61.8                 | 61.4                 | 61.0                 |
| 800.0                   | 65.7                | 64.5                | 63.3                | 62.9                 | 62.3                 | 62.0                 |
| 1000.0                  | 65.9                | 64.7                | 64.1                | 63.5                 | 62.4                 | 62.2                 |
| 1250.0                  | 66.1                | 64.9                | 64.5                | 64.1                 | 63.0                 | 63.0                 |
| 1600.0                  | 66.2                | 65.0                | 64.3                | 64.0                 | 63.0                 | 62.7                 |
| 2000.0                  | 65.5                | 64.9                | 64.2                | 64.0                 | 62.8                 | 62.7                 |
| 2500.0                  | 64.7                | 64.3                | 63.4                | 63.7                 | 62.3                 | 62.2                 |
| 3150.0                  | 64.1                | 63.7                | 62.8                | 63.4                 | 62.1                 | 62.1                 |
| 4000.0                  | 63.5                | 63.2                | 62.5                | 62.7                 | 61.4                 | 61.6                 |
| 5000.0                  | 62.9                | 62.7                | 61.9                | 62.4                 | 61.1                 | 61.3                 |
| 6300.0                  | 62.1                | 61.9                | 60.9                | 61.8                 | 60.5                 | 61.1                 |
| 8000.0                  | 61.6                | 61.6                | 60.7                | 61.2                 | 60.3                 | 60.7                 |
| 10000.0                 | 61.2                | 61.0                | 60.1                | 60.9                 | 59.9                 | 60.2                 |
| 12500.0                 | 60.7                | 60.5                | 59.7                | 60.5                 | 59.4                 | 60.2                 |
| 16000.0                 | 60.2                | 60.2                | 59.8                | 60.2                 | 59.3                 | 59.7                 |
| 20000.0                 | 59.2                | 59.2                | 58.9                | 59.2                 | 58.3                 | 58.4                 |
| 25000.0                 | 58.6                | 58.3                | 58.5                | 58.3                 | 57.5                 | 57.4                 |
| 31500.0                 | 57.2                | 56.8                | 57.0                | 56.6                 | 55.9                 | 55.6                 |
| 40000.0                 | 57.4                | 56.0                | 55.9                | 55.4                 | 55.6                 | 54.4                 |
| OVERALL<br>SPL          | 76.7                | 75.9                | 75.2                | 75.2                 | 74.2                 | 74.2                 |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.69 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 722.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.365

RUN NUMBER 219

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.049$   
TEMPERATURE RATIO  $TR = 2.273$   
MACH NUMBER  $MJ = 0.265$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 2.244$   
JET DENSITY RATIO  $DJ/D0 = 0.446$   
JET VELOCITY RATIO  $VJ/A0 = 0.397$   
JET VELOCITY  $VJ = 443.2$  FPS

$TR/TJ = 1.013$   
 $DR/D0 = 0.461$   
 $DR/DJ = 1.035$   
MASS FLOW = 0.323 POUNDS PER SECOND  
THRUST = 4.52 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |       | MICRO<br>PHONE<br>NO. ANGLE |       | MICRO<br>PHONE<br>NO. ANGLE |       |
|--|-----------------------------|------|-----------------------------|------|-----------------------------|------|-----------------------------|-------|-----------------------------|-------|-----------------------------|-------|
|  | 10                          | 82.5 | 11                          | 90.0 | 12                          | 97.5 | 13                          | 105.0 | 14                          | 112.5 | 15                          | 120.0 |
| 200.0                                  | 54.9                        |      | 57.5                        |      | 58.3                        |      | 56.8                        |       | 55.7                        |       | 55.7                        |       |
| 250.0                                  | 59.0                        |      | 59.2                        |      | 59.8                        |      | 57.4                        |       | 57.6                        |       | 56.9                        |       |
| 315.2                                  | 61.4                        |      | 61.4                        |      | 61.3                        |      | 60.1                        |       | 60.8                        |       | 60.4                        |       |
| 400.0                                  | 63.2                        |      | 62.3                        |      | 62.3                        |      | 61.2                        |       | 61.7                        |       | 60.9                        |       |
| 500.0                                  | 63.4                        |      | 63.0                        |      | 62.6                        |      | 62.1                        |       | 61.2                        |       | 60.7                        |       |
| 630.0                                  | 64.8                        |      | 63.8                        |      | 63.2                        |      | 62.6                        |       | 62.5                        |       | 61.9                        |       |
| 800.0                                  | 65.6                        |      | 65.0                        |      | 64.3                        |      | 63.1                        |       | 63.1                        |       | 62.4                        |       |
| 1000.0                                 | 65.2                        |      | 64.6                        |      | 64.2                        |      | 63.6                        |       | 62.4                        |       | 62.6                        |       |
| 1250.0                                 | 65.2                        |      | 64.6                        |      | 64.3                        |      | 63.8                        |       | 63.2                        |       | 62.6                        |       |
| 1600.0                                 | 64.8                        |      | 64.4                        |      | 64.0                        |      | 63.4                        |       | 62.6                        |       | 62.3                        |       |
| 2000.0                                 | 64.1                        |      | 64.4                        |      | 63.9                        |      | 63.5                        |       | 62.5                        |       | 62.3                        |       |
| 2500.0                                 | 63.5                        |      | 63.8                        |      | 63.0                        |      | 63.2                        |       | 62.5                        |       | 62.0                        |       |
| 3150.0                                 | 62.9                        |      | 63.1                        |      | 62.7                        |      | 62.6                        |       | 62.2                        |       | 61.6                        |       |
| 4000.0                                 | 62.5                        |      | 62.7                        |      | 62.4                        |      | 62.5                        |       | 61.7                        |       | 60.9                        |       |
| 5000.0                                 | 61.8                        |      | 62.1                        |      | 62.3                        |      | 61.7                        |       | 61.6                        |       | 60.8                        |       |
| 6300.0                                 | 61.5                        |      | 62.3                        |      | 61.8                        |      | 61.8                        |       | 61.5                        |       | 60.8                        |       |
| 8000.0                                 | 61.2                        |      | 62.3                        |      | 60.5                        |      | 60.9                        |       | 60.7                        |       | 60.2                        |       |
| 10000.0                                | 61.5                        |      | 61.9                        |      | 60.1                        |      | 60.2                        |       | 60.1                        |       | 59.5                        |       |
| 12500.0                                | 61.7                        |      | 60.5                        |      | 60.2                        |      | 60.1                        |       | 59.9                        |       | 59.5                        |       |
| 16000.0                                | 60.6                        |      | 60.6                        |      | 59.2                        |      | 59.8                        |       | 59.6                        |       | 59.0                        |       |
| 20000.0                                | 59.7                        |      | 60.8                        |      | 59.5                        |      | 59.6                        |       | 59.1                        |       | 58.9                        |       |
| 25000.0                                | 60.4                        |      | 59.6                        |      | 59.3                        |      | 59.5                        |       | 58.8                        |       | 58.9                        |       |
| 31500.0                                | 60.8                        |      | 60.0                        |      | 59.4                        |      | 59.4                        |       | 58.8                        |       | 59.3                        |       |
| 40000.0                                | 60.8                        |      | 60.0                        |      | 59.4                        |      | 60.0                        |       | 58.3                        |       | 60.5                        |       |
| OVERALL<br>SPL                         | 76.5                        |      | 76.3                        |      | 75.8                        |      | 75.4                        |       | 74.9                        |       | 74.5                        |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 56.5                                    | 57.6                                    | 56.4                                    | 56.7                                    |
| 250.0                                  | 58.7                                    | 57.7                                    | 57.0                                    | 58.1                                    |
| 315.2                                  | 60.1                                    | 59.8                                    | 58.2                                    | 58.8                                    |
| 400.0                                  | 60.8                                    | 60.1                                    | 59.9                                    | 59.8                                    |
| 500.0                                  | 61.2                                    | 60.2                                    | 60.1                                    | 59.7                                    |
| 630.0                                  | 62.5                                    | 61.0                                    | 60.1                                    | 59.5                                    |
| 800.0                                  | 62.8                                    | 61.9                                    | 61.0                                    | 60.2                                    |
| 1000.0                                 | 62.8                                    | 61.7                                    | 60.1                                    | 59.7                                    |
| 1250.0                                 | 62.2                                    | 61.3                                    | 59.6                                    | 58.5                                    |
| 1600.0                                 | 62.1                                    | 60.4                                    | 59.3                                    | 57.6                                    |
| 2000.0                                 | 61.9                                    | 61.2                                    | 59.5                                    | 57.0                                    |
| 2500.0                                 | 61.6                                    | 60.8                                    | 58.8                                    | 56.5                                    |
| 3150.0                                 | 61.4                                    | 60.3                                    | 58.6                                    | 56.2                                    |
| 4000.0                                 | 61.2                                    | 60.1                                    | 58.5                                    | 55.3                                    |
| 5000.0                                 | 61.0                                    | 59.1                                    | 57.8                                    | 54.7                                    |
| 6300.0                                 | 60.8                                    | 58.9                                    | 57.0                                    | 55.0                                    |
| 8000.0                                 | 60.1                                    | 58.4                                    | 56.0                                    | 53.3                                    |
| 10000.0                                | 59.5                                    | 57.1                                    | 54.9                                    | 52.1                                    |
| 12500.0                                | 58.9                                    | 56.5                                    | 53.7                                    | 51.4                                    |
| 16000.0                                | 58.7                                    | 55.8                                    | 52.8                                    | 50.3                                    |
| 20000.0                                | 58.2                                    | 54.8                                    | 51.9                                    | 49.2                                    |
| 25000.0                                | 57.4                                    | 53.7                                    | 50.5                                    | 46.8                                    |
| 31500.0                                | 56.9                                    | 52.6                                    | 49.2                                    | 45.3                                    |
| 40000.0                                | 56.4                                    | 52.2                                    | 48.0                                    | 45.3                                    |
| OVERALL<br>SPL                         | 74.4                                    | 73.0                                    | 71.6                                    | 70.4                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.09 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 773.00 DEG.F, CHAMBER TEMPERATURE = 98.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.363

RUN NUMBER 50

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.077$   
TEMPERATURE RATIO  $T_r = 2.210$   
MACH NUMBER  $M_J = 0.331$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 2.167$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.462$   
JET VELOCITY RATIO  $V_J/A_0 = 0.487$   
JET VELOCITY  $V_J = 564.2$  FPS

$T_r/T_J = 1.020$   
 $\rho_r/\rho_0 = 0.487$   
 $\rho_r/\rho_J = 1.056$   
MASS FLOW = 0.412 POUNDS PER SECOND  
THRUST = 7.06 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 66.6                                  | 66.7                                  | 63.6                                  | 62.2                                  | 61.9                                  | 60.1                                  |
| 250.0                                  | 69.3                                  | 70.1                                  | 68.6                                  | 66.9                                  | 65.6                                  | 63.3                                  |
| 315.2                                  | 71.9                                  | 72.0                                  | 71.0                                  | 68.7                                  | 67.6                                  | 66.2                                  |
| 400.0                                  | 74.2                                  | 76.3                                  | 72.8                                  | 71.0                                  | 70.4                                  | 68.7                                  |
| 500.0                                  | 77.6                                  | 76.3                                  | 75.0                                  | 72.3                                  | 71.7                                  | 70.3                                  |
| 630.0                                  | 75.4                                  | 76.9                                  | 76.9                                  | 74.6                                  | 73.7                                  | 71.6                                  |
| 800.0                                  | 77.8                                  | 78.6                                  | 77.0                                  | 75.0                                  | 74.9                                  | 73.1                                  |
| 1000.0                                 | 74.7                                  | 76.8                                  | 76.8                                  | 75.0                                  | 75.3                                  | 74.0                                  |
| 1250.0                                 | 73.2                                  | 76.1                                  | 76.8                                  | 75.3                                  | 75.6                                  | 74.0                                  |
| 1600.0                                 | 70.5                                  | 73.8                                  | 75.0                                  | 74.2                                  | 74.9                                  | 74.2                                  |
| 2000.0                                 | 68.1                                  | 72.0                                  | 73.8                                  | 73.2                                  | 74.6                                  | 73.6                                  |
| 2500.0                                 | 65.5                                  | 69.6                                  | 71.8                                  | 71.5                                  | 73.4                                  | 73.0                                  |
| 3150.0                                 | 62.8                                  | 67.2                                  | 69.5                                  | 70.4                                  | 72.4                                  | 72.3                                  |
| 4000.0                                 | 62.9                                  | 66.2                                  | 67.7                                  | 68.8                                  | 71.8                                  | 71.1                                  |
| 5000.0                                 | 61.3                                  | 65.0                                  | 65.6                                  | 66.6                                  | 70.4                                  | 70.4                                  |
| 6300.0                                 | 60.5                                  | 62.3                                  | 63.5                                  | 65.0                                  | 68.8                                  | 69.1                                  |
| 8000.0                                 | 60.5                                  | 61.6                                  | 62.4                                  | 63.8                                  | 67.5                                  | 68.1                                  |
| 10000.0                                | 60.0                                  | 59.3                                  | 61.2                                  | 62.3                                  | 66.4                                  | 67.1                                  |
| 12500.0                                | 60.0                                  | 59.4                                  | 60.0                                  | 61.2                                  | 65.3                                  | 66.3                                  |
| 16000.0                                | 57.8                                  | 58.6                                  | 58.8                                  | 60.1                                  | 64.3                                  | 65.4                                  |
| 20000.0                                | 55.1                                  | 56.7                                  | 57.4                                  | 58.6                                  | 62.9                                  | 64.2                                  |
| 25000.0                                | 54.8                                  | 56.6                                  | 56.4                                  | 57.4                                  | 61.9                                  | 63.6                                  |
| 31500.0                                | 55.4                                  | 57.1                                  | 54.7                                  | 55.7                                  | 60.3                                  | 62.3                                  |
| 40000.0                                | 58.4                                  | 59.2                                  | 54.2                                  | 55.0                                  | 59.4                                  | 61.4                                  |
| OVERALL<br>SPL                         | 84.6                                  | 86.0                                  | 85.6                                  | 84.2                                  | 85.0                                  | 84.1                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 58.1                                  | 57.5                                  | 57.2                                  | 58.6                                   | 57.6                                   | 58.4                                   |
| 250.0                                  | 61.6                                  | 60.2                                  | 58.7                                  | 60.0                                   | 59.2                                   | 59.0                                   |
| 315.2                                  | 63.6                                  | 61.6                                  | 60.8                                  | 61.5                                   | 61.0                                   | 60.8                                   |
| 400.0                                  | 66.4                                  | 64.2                                  | 63.5                                  | 62.8                                   | 62.7                                   | 62.1                                   |
| 500.0                                  | 68.4                                  | 66.8                                  | 65.9                                  | 64.9                                   | 64.2                                   | 63.7                                   |
| 630.0                                  | 70.1                                  | 68.2                                  | 67.2                                  | 66.9                                   | 66.1                                   | 65.4                                   |
| 800.0                                  | 71.4                                  | 69.6                                  | 68.5                                  | 67.9                                   | 67.5                                   | 66.7                                   |
| 1000.0                                 | 72.1                                  | 70.3                                  | 69.0                                  | 68.6                                   | 68.3                                   | 67.3                                   |
| 1250.0                                 | 72.3                                  | 71.2                                  | 70.0                                  | 69.5                                   | 69.0                                   | 68.3                                   |
| 1600.0                                 | 72.6                                  | 71.0                                  | 70.1                                  | 69.5                                   | 68.9                                   | 68.2                                   |
| 2000.0                                 | 72.4                                  | 71.2                                  | 70.3                                  | 69.6                                   | 69.2                                   | 68.4                                   |
| 2500.0                                 | 71.8                                  | 70.8                                  | 69.7                                  | 69.3                                   | 68.1                                   | 68.2                                   |
| 3150.0                                 | 71.3                                  | 70.2                                  | 69.6                                  | 69.2                                   | 69.0                                   | 68.4                                   |
| 4000.0                                 | 70.5                                  | 70.0                                  | 69.3                                  | 68.7                                   | 68.1                                   | 67.9                                   |
| 5000.0                                 | 70.1                                  | 69.3                                  | 68.5                                  | 68.5                                   | 67.7                                   | 67.6                                   |
| 6300.0                                 | 69.2                                  | 68.4                                  | 67.5                                  | 67.8                                   | 67.0                                   | 67.0                                   |
| 8000.0                                 | 68.4                                  | 67.9                                  | 67.2                                  | 67.1                                   | 66.7                                   | 66.7                                   |
| 10000.0                                | 67.8                                  | 67.1                                  | 66.4                                  | 66.6                                   | 66.1                                   | 66.4                                   |
| 12500.0                                | 67.1                                  | 66.3                                  | 66.0                                  | 66.2                                   | 65.5                                   | 66.2                                   |
| 16000.0                                | 66.3                                  | 65.7                                  | 65.8                                  | 65.5                                   | 65.1                                   | 65.7                                   |
| 20000.0                                | 65.3                                  | 64.5                                  | 64.8                                  | 64.5                                   | 63.9                                   | 64.4                                   |
| 25000.0                                | 64.4                                  | 63.6                                  | 64.2                                  | 63.7                                   | 63.3                                   | 63.4                                   |
| 31500.0                                | 62.6                                  | 61.9                                  | 62.9                                  | 62.0                                   | 61.8                                   | 61.6                                   |
| 40000.0                                | 61.6                                  | 61.0                                  | 61.7                                  | 60.6                                   | 61.2                                   | 60.2                                   |
| OVERALL<br>SPL                         | 83.0                                  | 81.8                                  | 81.0                                  | 80.6                                   | 80.1                                   | 79.8                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.09 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 743.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.363

RUN NUMBER 220

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.077  
TEMPERATURE RATIO TR = 2.313  
MACH NUMBER MJ = 0.331  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.268  
JET DENSITY RATIO DJ/D0 = 0.441  
JET VELOCITY RATIO VJ/A0 = 0.499  
JET VELOCITY VJ = 557.7 FPS

TR/TJ = 1.020  
DR/D0 = 0.465  
DR/DJ = 1.056  
MASS FLOW = 0.403 POUNDS PER SECOND  
THRUST = 7.07 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 57.8                                   | 60.6                                   | 60.4                                   | 59.0                                    | 59.4                                    | 57.7                                    |
| 250.0                                  | 60.2                                   | 61.0                                   | 60.4                                   | 60.3                                    | 60.7                                    | 60.5                                    |
| 315.2                                  | 62.5                                   | 63.5                                   | 63.5                                   | 63.2                                    | 63.5                                    | 62.7                                    |
| 400.0                                  | 65.0                                   | 65.1                                   | 64.6                                   | 64.0                                    | 65.5                                    | 64.2                                    |
| 500.0                                  | 67.2                                   | 66.2                                   | 65.9                                   | 65.3                                    | 65.9                                    | 64.2                                    |
| 630.0                                  | 68.7                                   | 67.9                                   | 67.5                                   | 66.9                                    | 66.9                                    | 66.3                                    |
| 800.0                                  | 70.4                                   | 69.6                                   | 68.6                                   | 68.4                                    | 67.9                                    | 67.6                                    |
| 1000.0                                 | 71.0                                   | 69.9                                   | 68.6                                   | 69.0                                    | 68.2                                    | 67.3                                    |
| 1250.0                                 | 71.4                                   | 70.3                                   | 69.8                                   | 69.6                                    | 69.6                                    | 68.0                                    |
| 1600.0                                 | 71.4                                   | 70.6                                   | 69.7                                   | 69.4                                    | 69.7                                    | 68.3                                    |
| 2000.0                                 | 71.0                                   | 70.8                                   | 69.9                                   | 69.6                                    | 69.5                                    | 68.5                                    |
| 2500.0                                 | 70.6                                   | 70.1                                   | 69.5                                   | 69.6                                    | 69.6                                    | 68.4                                    |
| 3150.0                                 | 70.6                                   | 69.8                                   | 69.2                                   | 69.0                                    | 69.0                                    | 68.0                                    |
| 4000.0                                 | 69.7                                   | 69.5                                   | 68.9                                   | 68.6                                    | 68.6                                    | 67.3                                    |
| 5000.0                                 | 68.7                                   | 69.0                                   | 68.4                                   | 67.8                                    | 68.3                                    | 66.7                                    |
| 6300.0                                 | 68.2                                   | 68.9                                   | 68.2                                   | 67.7                                    | 68.6                                    | 67.1                                    |
| 8000.0                                 | 67.7                                   | 68.5                                   | 66.4                                   | 66.9                                    | 67.2                                    | 65.7                                    |
| 10000.0                                | 67.8                                   | 68.0                                   | 65.9                                   | 66.4                                    | 67.1                                    | 65.3                                    |
| 12500.0                                | 67.7                                   | 66.5                                   | 66.0                                   | 65.9                                    | 66.5                                    | 64.5                                    |
| 16000.0                                | 66.3                                   | 66.3                                   | 64.8                                   | 65.3                                    | 66.0                                    | 64.0                                    |
| 20000.0                                | 64.8                                   | 66.5                                   | 65.1                                   | 64.9                                    | 65.4                                    | 63.6                                    |
| 25000.0                                | 65.4                                   | 65.1                                   | 64.8                                   | 64.5                                    | 65.0                                    | 63.5                                    |
| 31500.0                                | 65.9                                   | 65.5                                   | 64.8                                   | 64.5                                    | 65.1                                    | 63.5                                    |
| 40000.0                                | 65.3                                   | 65.8                                   | 64.7                                   | 65.1                                    | 64.8                                    | 63.9                                    |
| OVERALL<br>SPL                         | 82.2                                   | 81.8                                   | 81.0                                   | 80.8                                    | 81.0                                    | 79.8                                    |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 58.2                                    | 59.8                                    | 58.4                                    | 59.0                                    |
| 250.0                                  | 59.8                                    | 60.3                                    | 60.1                                    | 60.1                                    |
| 315.2                                  | 62.1                                    | 61.9                                    | 62.2                                    | 62.8                                    |
| 400.0                                  | 63.9                                    | 63.2                                    | 63.9                                    | 63.4                                    |
| 500.0                                  | 64.8                                    | 63.9                                    | 63.6                                    | 63.5                                    |
| 630.0                                  | 66.1                                    | 65.3                                    | 64.7                                    | 64.4                                    |
| 800.0                                  | 66.6                                    | 65.8                                    | 66.1                                    | 65.0                                    |
| 1000.0                                 | 67.4                                    | 66.6                                    | 65.4                                    | 64.6                                    |
| 1250.0                                 | 67.8                                    | 66.4                                    | 65.6                                    | 64.1                                    |
| 1600.0                                 | 67.7                                    | 66.0                                    | 64.5                                    | 63.6                                    |
| 2000.0                                 | 68.1                                    | 66.3                                    | 65.1                                    | 63.5                                    |
| 2500.0                                 | 67.8                                    | 66.4                                    | 64.9                                    | 62.8                                    |
| 3150.0                                 | 67.7                                    | 66.6                                    | 64.6                                    | 62.4                                    |
| 4000.0                                 | 67.0                                    | 66.0                                    | 64.5                                    | 61.6                                    |
| 5000.0                                 | 66.5                                    | 65.1                                    | 63.7                                    | 61.1                                    |
| 6300.0                                 | 66.5                                    | 65.0                                    | 63.0                                    | 60.7                                    |
| 8000.0                                 | 65.7                                    | 64.2                                    | 61.8                                    | 59.6                                    |
| 10000.0                                | 65.2                                    | 63.2                                    | 60.9                                    | 59.0                                    |
| 12500.0                                | 64.2                                    | 62.4                                    | 59.8                                    | 57.7                                    |
| 16000.0                                | 63.6                                    | 61.6                                    | 59.1                                    | 56.4                                    |
| 20000.0                                | 62.9                                    | 60.4                                    | 58.1                                    | 55.4                                    |
| 25000.0                                | 62.2                                    | 59.6                                    | 57.2                                    | 53.9                                    |
| 31500.0                                | 62.0                                    | 59.1                                    | 56.6                                    | 52.8                                    |
| 40000.0                                | 61.7                                    | 58.8                                    | 55.8                                    | 51.9                                    |
| OVERALL<br>SPL                         | 79.3                                    | 78.0                                    | 76.8                                    | 75.5                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.60 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 783.00 DEG.F, CHAMBER TEMPERATURE = 98.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 51

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.113  
TEMPERATURE RATIO TR = 2.228  
MACH NUMBER MJ = 0.399  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.165  
JET DENSITY RATIO DJ/D0 = 0.462  
JET VELOCITY RATIO VJ/A0 = 0.587  
JET VELOCITY VJ = 679.5 FPS

TR/TJ = 1.029  
DR/D0 = 0.499  
DR/DJ = 1.082  
MASS FLOW = 0.496 POUNDS PER SECOND  
THRUST = 10.25 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 69.6                                  | 69.6                                  | 67.8                                  | 65.4                                  | 64.7                                  | 63.0                                  |
| 250.0                                  | 73.5                                  | 73.5                                  | 73.1                                  | 70.2                                  | 70.0                                  | 67.0                                  |
| 315.2                                  | 76.4                                  | 76.0                                  | 76.0                                  | 72.8                                  | 71.7                                  | 70.3                                  |
| 400.0                                  | 78.9                                  | 80.4                                  | 77.6                                  | 75.5                                  | 74.7                                  | 72.8                                  |
| 500.0                                  | 81.8                                  | 80.6                                  | 80.1                                  | 77.8                                  | 77.0                                  | 74.7                                  |
| 630.0                                  | 80.2                                  | 82.1                                  | 82.1                                  | 80.1                                  | 79.2                                  | 76.6                                  |
| 800.0                                  | 83.4                                  | 84.3                                  | 83.5                                  | 81.5                                  | 80.4                                  | 78.2                                  |
| 1000.0                                 | 80.8                                  | 83.0                                  | 83.9                                  | 82.2                                  | 81.0                                  | 79.8                                  |
| 1250.0                                 | 78.9                                  | 82.6                                  | 83.5                                  | 82.1                                  | 81.9                                  | 80.3                                  |
| 1600.0                                 | 76.3                                  | 80.3                                  | 81.4                                  | 81.2                                  | 81.4                                  | 80.2                                  |
| 2000.0                                 | 74.5                                  | 78.8                                  | 80.3                                  | 80.5                                  | 81.1                                  | 80.1                                  |
| 2500.0                                 | 71.9                                  | 76.3                                  | 78.2                                  | 78.8                                  | 80.2                                  | 79.8                                  |
| 3150.0                                 | 69.6                                  | 74.9                                  | 76.1                                  | 77.5                                  | 79.4                                  | 79.0                                  |
| 4000.0                                 | 68.7                                  | 73.6                                  | 74.8                                  | 76.2                                  | 78.7                                  | 78.1                                  |
| 5000.0                                 | 67.1                                  | 72.4                                  | 72.5                                  | 74.2                                  | 77.1                                  | 77.2                                  |
| 6300.0                                 | 65.9                                  | 70.8                                  | 70.5                                  | 72.5                                  | 75.7                                  | 76.0                                  |
| 8000.0                                 | 65.5                                  | 69.5                                  | 69.0                                  | 71.0                                  | 74.2                                  | 74.7                                  |
| 10000.0                                | 65.1                                  | 67.8                                  | 67.6                                  | 69.5                                  | 72.8                                  | 73.5                                  |
| 12500.0                                | 64.9                                  | 67.7                                  | 65.8                                  | 68.1                                  | 71.6                                  | 72.4                                  |
| 16000.0                                | 63.8                                  | 67.5                                  | 64.4                                  | 66.8                                  | 70.4                                  | 71.5                                  |
| 20000.0                                | 61.8                                  | 65.9                                  | 62.4                                  | 65.0                                  | 68.5                                  | 70.1                                  |
| 25000.0                                | 61.5                                  | 66.0                                  | 61.3                                  | 63.5                                  | 67.4                                  | 69.4                                  |
| 31500.0                                | 62.0                                  | 66.1                                  | 59.1                                  | 61.1                                  | 65.5                                  | 67.9                                  |
| 40000.0                                | 64.8                                  | 67.9                                  | 57.6                                  | 59.7                                  | 64.5                                  | 67.3                                  |
| OVERALL<br>SPL                         | 89.8                                  | 91.6                                  | 91.8                                  | 90.8                                  | 91.1                                  | 90.1                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 61.5                                  | 60.7                                  | 59.6                                  | 59.8                                   | 60.2                                   | 60.8                                   |
| 250.0                                  | 64.6                                  | 64.0                                  | 62.2                                  | 61.8                                   | 62.1                                   | 62.5                                   |
| 315.2                                  | 66.6                                  | 65.2                                  | 64.6                                  | 64.2                                   | 63.8                                   | 64.2                                   |
| 400.0                                  | 70.1                                  | 67.7                                  | 66.6                                  | 66.0                                   | 66.1                                   | 65.6                                   |
| 500.0                                  | 71.6                                  | 70.5                                  | 68.8                                  | 68.0                                   | 68.3                                   | 67.5                                   |
| 630.0                                  | 74.0                                  | 72.4                                  | 71.0                                  | 70.3                                   | 70.0                                   | 69.6                                   |
| 800.0                                  | 75.6                                  | 74.3                                  | 72.7                                  | 71.9                                   | 71.4                                   | 71.0                                   |
| 1000.0                                 | 76.7                                  | 75.4                                  | 74.0                                  | 73.1                                   | 72.7                                   | 71.6                                   |
| 1250.0                                 | 77.4                                  | 76.4                                  | 75.3                                  | 74.3                                   | 73.9                                   | 73.2                                   |
| 1600.0                                 | 78.1                                  | 76.9                                  | 75.5                                  | 74.6                                   | 74.2                                   | 73.1                                   |
| 2000.0                                 | 78.1                                  | 77.1                                  | 75.9                                  | 75.2                                   | 74.6                                   | 73.6                                   |
| 2500.0                                 | 78.1                                  | 76.9                                  | 75.5                                  | 74.8                                   | 74.6                                   | 73.5                                   |
| 3150.0                                 | 78.0                                  | 76.7                                  | 75.5                                  | 75.1                                   | 74.8                                   | 74.0                                   |
| 4000.0                                 | 77.5                                  | 76.7                                  | 75.3                                  | 74.4                                   | 74.4                                   | 73.7                                   |
| 5000.0                                 | 77.2                                  | 76.2                                  | 74.6                                  | 74.1                                   | 74.1                                   | 73.6                                   |
| 6300.0                                 | 76.3                                  | 75.4                                  | 73.7                                  | 73.5                                   | 73.5                                   | 72.9                                   |
| 8000.0                                 | 75.6                                  | 74.8                                  | 73.3                                  | 72.7                                   | 73.0                                   | 72.7                                   |
| 10000.0                                | 74.8                                  | 73.9                                  | 72.4                                  | 72.8                                   | 72.6                                   | 72.7                                   |
| 12500.0                                | 74.0                                  | 73.2                                  | 71.6                                  | 71.1                                   | 71.3                                   | 71.5                                   |
| 16000.0                                | 73.2                                  | 72.5                                  | 71.4                                  | 70.4                                   | 70.9                                   | 71.0                                   |
| 20000.0                                | 72.1                                  | 71.2                                  | 70.4                                  | 69.0                                   | 69.5                                   | 69.5                                   |
| 25000.0                                | 71.5                                  | 70.2                                  | 69.7                                  | 67.8                                   | 68.6                                   | 68.4                                   |
| 31500.0                                | 70.2                                  | 68.4                                  | 68.2                                  | 65.7                                   | 66.9                                   | 66.3                                   |
| 40000.0                                | 69.9                                  | 67.3                                  | 67.0                                  | 64.0                                   | 66.1                                   | 64.8                                   |
| OVERALL<br>SPL                         | 88.9                                  | 87.7                                  | 86.4                                  | 85.7                                   | 85.6                                   | 85.0                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.59 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 760.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 221

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.112  
TEMPERATURE RATIO TR = 2.346  
MACH NUMBER MJ = 0.398  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.281  
JET DENSITY RATIO DJ/D0 = 0.438  
JET VELOCITY RATIO VJ/A0 = 0.601  
JET VELOCITY VJ = 671.6 FPS

TR/TJ = 1.029  
DR/D0 = 0.474  
DR/DJ = 1.081  
MASS FLOW = 0.482 POUNDS PER SECOND  
THRUST = 10.20 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 59.2                        | 62.1                        | 61.6                        | 61.4                        | 60.2                        | 59.9                        |
| 250.0                                  | 62.7                        | 63.5                        | 62.4                        | 62.0                        | 63.0                        | 62.8                        |
| 315.2                                  | 65.0                        | 65.7                        | 65.9                        | 66.5                        | 65.3                        | 66.0                        |
| 400.0                                  | 68.0                        | 68.3                        | 67.5                        | 66.9                        | 67.9                        | 67.5                        |
| 500.0                                  | 70.2                        | 69.8                        | 69.7                        | 68.9                        | 66.1                        | 67.9                        |
| 630.0                                  | 73.0                        | 72.4                        | 71.2                        | 70.9                        | 70.2                        | 70.1                        |
| 800.0                                  | 74.7                        | 74.0                        | 72.2                        | 71.9                        | 71.3                        | 71.6                        |
| 1000.0                                 | 75.8                        | 74.0                        | 73.0                        | 72.9                        | 72.5                        | 72.0                        |
| 1250.0                                 | 76.5                        | 74.8                        | 74.8                        | 73.9                        | 73.7                        | 72.7                        |
| 1600.0                                 | 76.3                        | 75.7                        | 74.6                        | 74.1                        | 73.8                        | 73.0                        |
| 2000.0                                 | 76.3                        | 75.9                        | 75.1                        | 74.7                        | 73.7                        | 73.4                        |
| 2500.0                                 | 76.1                        | 75.3                        | 74.6                        | 74.4                        | 73.9                        | 73.4                        |
| 3150.0                                 | 76.1                        | 75.3                        | 74.6                        | 74.4                        | 73.6                        | 73.3                        |
| 4000.0                                 | 75.6                        | 75.0                        | 74.6                        | 74.0                        | 73.4                        | 72.9                        |
| 5000.0                                 | 74.9                        | 74.5                        | 74.4                        | 73.5                        | 72.9                        | 72.5                        |
| 6300.0                                 | 74.5                        | 74.4                        | 73.7                        | 73.4                        | 72.8                        | 72.4                        |
| 8000.0                                 | 73.7                        | 74.2                        | 72.2                        | 72.3                        | 71.8                        | 71.5                        |
| 10000.0                                | 74.0                        | 73.5                        | 71.5                        | 71.6                        | 71.0                        | 70.8                        |
| 12500.0                                | 73.3                        | 71.8                        | 71.5                        | 71.1                        | 70.8                        | 70.4                        |
| 16000.0                                | 71.9                        | 71.3                        | 70.2                        | 70.6                        | 70.2                        | 69.8                        |
| 20000.0                                | 70.3                        | 71.5                        | 70.3                        | 70.0                        | 69.5                        | 69.3                        |
| 25000.0                                | 71.0                        | 70.2                        | 70.0                        | 69.7                        | 69.2                        | 68.9                        |
| 31500.0                                | 71.1                        | 70.8                        | 70.0                        | 69.7                        | 69.2                        | 69.0                        |
| 40000.0                                | 70.7                        | 71.0                        | 70.1                        | 70.2                        | 68.8                        | 69.5                        |
| OVERALL<br>SPL                         | 87.4                        | 86.8                        | 86.0                        | 85.6                        | 85.1                        | 84.7                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 60.6  |       | 60.9  |       | 60.5  |       | 59.9  |       |  |
| 250.0   | 64.2  |       | 62.4  |       | 62.6  |       | 62.1  |       |  |
| 315.2   | 65.9  |       | 64.3  |       | 63.5  |       | 63.9  |       |  |
| 400.0   | 67.1  |       | 66.3  |       | 65.0  |       | 66.2  |       |  |
| 500.0   | 68.2  |       | 67.3  |       | 66.6  |       | 66.3  |       |  |
| 630.0   | 70.1  |       | 69.6  |       | 68.1  |       | 66.5  |       |  |
| 800.0   | 70.9  |       | 70.3  |       | 69.5  |       | 68.2  |       |  |
| 1000.0  | 71.4  |       | 70.5  |       | 69.6  |       | 68.5  |       |  |
| 1250.0  | 72.3  |       | 71.3  |       | 70.0  |       | 67.9  |       |  |
| 1600.0  | 72.6  |       | 70.9  |       | 69.7  |       | 68.2  |       |  |
| 2000.0  | 72.8  |       | 71.7  |       | 70.2  |       | 68.2  |       |  |
| 2500.0  | 72.8  |       | 71.7  |       | 69.9  |       | 67.4  |       |  |
| 3150.0  | 73.0  |       | 71.6  |       | 70.1  |       | 67.4  |       |  |
| 4000.0  | 72.9  |       | 71.6  |       | 70.0  |       | 66.9  |       |  |
| 5000.0  | 72.6  |       | 70.7  |       | 69.1  |       | 66.0  |       |  |
| 6300.0  | 72.3  |       | 70.5  |       | 68.7  |       | 65.7  |       |  |
| 8000.0  | 71.3  |       | 69.9  |       | 67.4  |       | 64.7  |       |  |
| 10000.0 | 70.6  |       | 68.8  |       | 66.2  |       | 63.3  |       |  |
| 12500.0 | 70.0  |       | 68.2  |       | 65.3  |       | 62.6  |       |  |
| 16000.0 | 69.3  |       | 67.3  |       | 64.5  |       | 61.3  |       |  |
| 20000.0 | 68.6  |       | 66.3  |       | 63.4  |       | 60.1  |       |  |
| 25000.0 | 67.9  |       | 65.6  |       | 62.6  |       | 58.7  |       |  |
| 31500.0 | 67.6  |       | 64.9  |       | 61.8  |       | 57.5  |       |  |
| 40000.0 | 67.6  |       | 64.8  |       | 61.0  |       | 56.6  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 84.3  |       | 82.9  |       | 81.3  |       | 79.3  |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.20 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 796.00 DEG.F, CHAMBER TEMPERATURE = 97.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 52

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.155  
TEMPERATURE RATIO TR = 2.255  
MACH NUMBER MJ = 0.464  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.170  
JET DENSITY RATIO DJ/D0 = 0.461  
JET VELOCITY RATIO VJ/A0 = 0.684  
JET VELOCITY VJ = 791.4 FPS

TR/TJ = 1.039  
DR/D0 = 0.512  
DR/DJ = 1.112  
MASS FLOW = 0.577 POUNDS PER SECOND  
THRUST = 13.90 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 74.5                                  | 73.3                                  | 70.8                                  | 68.2                                  | 69.3                                  | 66.0                                  |
| 250.0                                  | 76.8                                  | 76.5                                  | 76.1                                  | 72.2                                  | 71.6                                  | 69.6                                  |
| 315.2                                  | 81.0                                  | 79.4                                  | 79.7                                  | 75.8                                  | 75.0                                  | 71.7                                  |
| 400.0                                  | 83.4                                  | 84.2                                  | 81.8                                  | 78.6                                  | 77.2                                  | 74.8                                  |
| 500.0                                  | 86.8                                  | 85.0                                  | 84.4                                  | 80.7                                  | 80.1                                  | 76.7                                  |
| 630.0                                  | 85.4                                  | 86.6                                  | 87.2                                  | 83.4                                  | 81.8                                  | 79.0                                  |
| 800.0                                  | 88.4                                  | 89.3                                  | 86.4                                  | 85.5                                  | 83.8                                  | 81.0                                  |
| 1000.0                                 | 86.8                                  | 88.5                                  | 89.0                                  | 86.2                                  | 84.6                                  | 82.2                                  |
| 1250.0                                 | 85.4                                  | 88.1                                  | 89.0                                  | 86.7                                  | 85.5                                  | 83.2                                  |
| 1600.0                                 | 81.9                                  | 85.5                                  | 87.2                                  | 85.6                                  | 85.4                                  | 83.7                                  |
| 2000.0                                 | 79.3                                  | 83.6                                  | 85.7                                  | 84.8                                  | 85.5                                  | 83.7                                  |
| 2500.0                                 | 76.4                                  | 80.8                                  | 83.1                                  | 83.1                                  | 84.6                                  | 83.2                                  |
| 3150.0                                 | 73.6                                  | 78.7                                  | 81.3                                  | 81.9                                  | 84.1                                  | 83.2                                  |
| 4000.0                                 | 72.9                                  | 77.6                                  | 79.6                                  | 80.6                                  | 83.4                                  | 82.4                                  |
| 5000.0                                 | 71.2                                  | 75.9                                  | 77.5                                  | 78.6                                  | 82.2                                  | 81.7                                  |
| 6300.0                                 | 69.5                                  | 73.9                                  | 75.6                                  | 76.6                                  | 80.6                                  | 80.7                                  |
| 8000.0                                 | 68.7                                  | 72.4                                  | 74.0                                  | 75.1                                  | 79.6                                  | 79.8                                  |
| 10000.0                                | 68.0                                  | 68.8                                  | 72.3                                  | 73.4                                  | 78.4                                  | 78.7                                  |
| 12500.0                                | 67.9                                  | 69.6                                  | 70.5                                  | 72.0                                  | 77.3                                  | 77.9                                  |
| 16000.0                                | 66.1                                  | 68.6                                  | 69.1                                  | 70.5                                  | 76.1                                  | 76.7                                  |
| 20000.0                                | 62.8                                  | 66.5                                  | 67.3                                  | 68.6                                  | 74.2                                  | 75.3                                  |
| 25000.0                                | 61.3                                  | 65.6                                  | 66.2                                  | 67.1                                  | 73.2                                  | 74.2                                  |
| 31500.0                                | 59.7                                  | 65.1                                  | 64.2                                  | 64.7                                  | 71.9                                  | 72.8                                  |
| 40000.0                                | 59.8                                  | 66.6                                  | 63.0                                  | 63.3                                  | 71.7                                  | 72.3                                  |
| OVERALL<br>SPL                         | 95.0                                  | 96.4                                  | 96.9                                  | 94.9                                  | 95.2                                  | 93.8                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 63.4                                  | 62.9                                  | 62.6                                  | 62.0                                   | 62.4                                   | 62.9                                   |
| 250.0                                  | 66.9                                  | 65.4                                  | 64.7                                  | 64.2                                   | 64.3                                   | 64.0                                   |
| 315.2                                  | 68.4                                  | 67.5                                  | 67.1                                  | 66.8                                   | 65.7                                   | 66.6                                   |
| 400.0                                  | 71.6                                  | 70.1                                  | 68.9                                  | 68.2                                   | 68.2                                   | 67.3                                   |
| 500.0                                  | 73.8                                  | 72.6                                  | 71.5                                  | 70.1                                   | 70.2                                   | 69.6                                   |
| 630.0                                  | 75.7                                  | 74.9                                  | 73.8                                  | 72.6                                   | 72.3                                   | 71.6                                   |
| 800.0                                  | 77.5                                  | 76.9                                  | 75.6                                  | 74.3                                   | 74.1                                   | 73.5                                   |
| 1000.0                                 | 78.8                                  | 78.5                                  | 77.3                                  | 75.9                                   | 75.5                                   | 74.8                                   |
| 1250.0                                 | 80.0                                  | 79.8                                  | 78.4                                  | 77.4                                   | 76.9                                   | 76.3                                   |
| 1600.0                                 | 80.7                                  | 80.4                                  | 78.8                                  | 77.5                                   | 77.3                                   | 76.7                                   |
| 2000.0                                 | 80.7                                  | 80.8                                  | 79.7                                  | 78.3                                   | 78.0                                   | 77.2                                   |
| 2500.0                                 | 80.8                                  | 80.8                                  | 79.6                                  | 78.5                                   | 78.2                                   | 77.5                                   |
| 3150.0                                 | 81.0                                  | 81.0                                  | 79.8                                  | 78.9                                   | 78.4                                   | 78.0                                   |
| 4000.0                                 | 80.9                                  | 81.0                                  | 79.7                                  | 78.6                                   | 78.2                                   | 77.9                                   |
| 5000.0                                 | 80.6                                  | 80.6                                  | 79.3                                  | 78.3                                   | 78.2                                   | 77.8                                   |
| 6300.0                                 | 79.9                                  | 80.1                                  | 78.4                                  | 77.8                                   | 77.6                                   | 77.4                                   |
| 8000.0                                 | 79.3                                  | 79.5                                  | 78.0                                  | 77.2                                   | 77.1                                   | 77.0                                   |
| 10000.0                                | 78.5                                  | 78.7                                  | 77.0                                  | 76.4                                   | 76.4                                   | 76.6                                   |
| 12500.0                                | 77.7                                  | 77.9                                  | 76.3                                  | 75.7                                   | 75.5                                   | 75.9                                   |
| 16000.0                                | 76.9                                  | 77.2                                  | 75.8                                  | 74.8                                   | 75.0                                   | 75.2                                   |
| 20000.0                                | 75.7                                  | 75.7                                  | 74.4                                  | 73.4                                   | 73.6                                   | 73.4                                   |
| 25000.0                                | 75.2                                  | 74.6                                  | 73.7                                  | 72.2                                   | 72.6                                   | 72.2                                   |
| 31500.0                                | 73.7                                  | 72.7                                  | 72.0                                  | 70.3                                   | 70.8                                   | 70.1                                   |
| 40000.0                                | 73.7                                  | 71.8                                  | 70.7                                  | 68.7                                   | 69.7                                   | 68.4                                   |
| OVERALL<br>SPL                         | 91.8                                  | 91.7                                  | 90.4                                  | 89.3                                   | 89.1                                   | 88.8                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.20 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 780.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 222

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.155  
TEMPERATURE RATIO TR = 2.385  
MACH NUMBER MJ = 0.465  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.295  
JET DENSITY RATIO DJ/D0 = 0.436  
JET VELOCITY RATIO VJ/A0 = 0.704  
JET VELOCITY VJ = 786.8 FPS

TR/TJ = 1.039  
DR/D0 = 0.484  
DR/DJ = 1.112  
MASS FLOW = 0.562 POUNDS PER SECOND  
THRUST = 13.92 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>NO.<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>NO.<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>NO.<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>NO.<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>NO.<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>NO.<br>120.0 |
|--|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
| 200.0                                  | 62.0                        |                      | 63.4                        |                      | 64.6                        |                      | 64.2                        |                       | 63.2                        |                       | 61.8                        |                       |
| 250.0                                  | 65.6                        |                      | 64.7                        |                      | 65.0                        |                      | 64.6                        |                       | 63.9                        |                       | 63.9                        |                       |
| 315.2                                  | 71.0                        |                      | 69.5                        |                      | 68.3                        |                      | 70.6                        |                       | 69.4                        |                       | 69.9                        |                       |
| 400.0                                  | 69.9                        |                      | 69.5                        |                      | 69.6                        |                      | 69.0                        |                       | 69.2                        |                       | 69.3                        |                       |
| 500.0                                  | 72.1                        |                      | 71.4                        |                      | 71.8                        |                      | 71.5                        |                       | 70.8                        |                       | 70.5                        |                       |
| 630.0                                  | 74.9                        |                      | 73.5                        |                      | 74.1                        |                      | 73.2                        |                       | 72.1                        |                       | 72.5                        |                       |
| 800.0                                  | 77.0                        |                      | 76.5                        |                      | 75.7                        |                      | 74.8                        |                       | 74.6                        |                       | 74.2                        |                       |
| 1000.0                                 | 78.6                        |                      | 77.2                        |                      | 76.5                        |                      | 75.8                        |                       | 75.0                        |                       | 74.6                        |                       |
| 1250.0                                 | 80.1                        |                      | 78.0                        |                      | 78.1                        |                      | 77.4                        |                       | 76.3                        |                       | 76.0                        |                       |
| 1600.0                                 | 80.1                        |                      | 78.5                        |                      | 78.2                        |                      | 77.8                        |                       | 76.6                        |                       | 76.4                        |                       |
| 2000.0                                 | 80.7                        |                      | 79.3                        |                      | 79.1                        |                      | 78.2                        |                       | 77.8                        |                       | 76.8                        |                       |
| 2500.0                                 | 80.1                        |                      | 79.1                        |                      | 78.8                        |                      | 78.2                        |                       | 77.9                        |                       | 77.4                        |                       |
| 3150.0                                 | 80.5                        |                      | 79.4                        |                      | 79.0                        |                      | 78.4                        |                       | 77.4                        |                       | 77.0                        |                       |
| 4000.0                                 | 80.1                        |                      | 79.3                        |                      | 78.9                        |                      | 78.5                        |                       | 77.8                        |                       | 77.1                        |                       |
| 5000.0                                 | 79.8                        |                      | 79.1                        |                      | 78.8                        |                      | 77.7                        |                       | 77.2                        |                       | 76.6                        |                       |
| 6300.0                                 | 79.2                        |                      | 79.3                        |                      | 78.4                        |                      | 77.6                        |                       | 76.9                        |                       | 76.6                        |                       |
| 8000.0                                 | 78.4                        |                      | 78.8                        |                      | 76.8                        |                      | 76.7                        |                       | 76.1                        |                       | 75.8                        |                       |
| 10000.0                                | 78.5                        |                      | 78.5                        |                      | 76.2                        |                      | 76.2                        |                       | 75.8                        |                       | 75.0                        |                       |
| 12500.0                                | 78.3                        |                      | 76.9                        |                      | 76.1                        |                      | 75.9                        |                       | 75.4                        |                       | 74.9                        |                       |
| 16000.0                                | 77.1                        |                      | 75.9                        |                      | 74.6                        |                      | 75.0                        |                       | 75.0                        |                       | 74.0                        |                       |
| 20000.0                                | 75.3                        |                      | 76.2                        |                      | 74.5                        |                      | 74.4                        |                       | 74.1                        |                       | 73.4                        |                       |
| 25000.0                                | 75.4                        |                      | 75.1                        |                      | 73.9                        |                      | 73.9                        |                       | 73.5                        |                       | 72.9                        |                       |
| 31500.0                                | 75.8                        |                      | 75.0                        |                      | 73.6                        |                      | 73.8                        |                       | 73.3                        |                       | 72.8                        |                       |
| 40000.0                                | 75.9                        |                      | 75.6                        |                      | 73.5                        |                      | 74.7                        |                       | 73.7                        |                       | 73.8                        |                       |
| OVERALL<br>SPL                         | 91.5                        |                      | 90.7                        |                      | 90.0                        |                      | 89.5                        |                       | 88.9                        |                       | 88.4                        |                       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 63.9                        | 61.7                        | 64.0                        | 63.7                        |
| 250.0                                  | 65.6                        | 64.6                        | 65.6                        | 64.6                        |
| 315.2                                  | 70.5                        | 66.5                        | 66.8                        | 68.6                        |
| 400.0                                  | 69.6                        | 67.9                        | 68.8                        | 68.4                        |
| 500.0                                  | 70.6                        | 70.1                        | 69.6                        | 68.6                        |
| 630.0                                  | 73.2                        | 72.5                        | 70.6                        | 69.8                        |
| 800.0                                  | 74.4                        | 72.6                        | 71.8                        | 70.2                        |
| 1000.0                                 | 74.8                        | 73.2                        | 72.3                        | 71.2                        |
| 1250.0                                 | 75.8                        | 74.4                        | 73.6                        | 70.8                        |
| 1600.0                                 | 76.1                        | 74.8                        | 72.8                        | 71.7                        |
| 2000.0                                 | 76.9                        | 75.8                        | 73.8                        | 71.4                        |
| 2500.0                                 | 77.2                        | 75.7                        | 73.9                        | 71.7                        |
| 3150.0                                 | 77.2                        | 75.5                        | 74.1                        | 71.5                        |
| 4000.0                                 | 77.5                        | 75.5                        | 74.0                        | 71.1                        |
| 5000.0                                 | 77.1                        | 75.1                        | 73.3                        | 70.0                        |
| 6300.0                                 | 76.8                        | 74.7                        | 72.9                        | 70.0                        |
| 8000.0                                 | 76.0                        | 74.1                        | 71.8                        | 69.2                        |
| 10000.0                                | 75.6                        | 73.0                        | 70.8                        | 67.9                        |
| 12500.0                                | 74.7                        | 72.2                        | 69.8                        | 67.0                        |
| 16000.0                                | 73.9                        | 71.3                        | 69.0                        | 65.8                        |
| 20000.0                                | 73.4                        | 70.4                        | 67.9                        | 64.9                        |
| 25000.0                                | 72.8                        | 69.3                        | 66.9                        | 63.5                        |
| 31500.0                                | 72.3                        | 68.9                        | 66.5                        | 62.4                        |
| 40000.0                                | 72.8                        | 69.2                        | 66.2                        | 62.1                        |
| OVERALL<br>SPL                         | 88.5                        | 86.6                        | 85.0                        | 82.9                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.93 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 867.00 DEG.F, CHAMBER TEMPERATURE = 96.00 DEG.F  
RELATIVE HUMIDITY = 32.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 72

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.206  
TEMPERATURE RATIO TR = 2.387  
MACH NUMBER MJ = 0.531  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.271  
JET DENSITY RATIO DJ/D0 = 0.440  
JET VELOCITY RATIO VJ/A0 = 0.800  
JET VELOCITY VJ = 925.0 FPS

TR/TJ = 1.051  
DR/D0 = 0.505  
DR/DJ = 1.147  
MASS FLOW = 0.645 POUNDS PER SECOND  
THRUST = 18.18 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 78.3                                  | 77.0                                  | 74.6                                  | 72.6                                  | 71.9                                  | 69.3                                  |
| 250.0                                  | 80.2                                  | 80.3                                  | 80.1                                  | 76.8                                  | 75.2                                  | 71.2                                  |
| 315.2                                  | 85.0                                  | 83.4                                  | 83.3                                  | 80.4                                  | 78.3                                  | 74.6                                  |
| 400.0                                  | 87.4                                  | 87.9                                  | 85.5                                  | 83.8                                  | 81.3                                  | 76.8                                  |
| 500.0                                  | 90.1                                  | 89.2                                  | 88.3                                  | 86.1                                  | 84.1                                  | 78.8                                  |
| 630.0                                  | 89.4                                  | 90.4                                  | 90.6                                  | 88.7                                  | 86.5                                  | 81.0                                  |
| 800.0                                  | 92.8                                  | 93.5                                  | 92.5                                  | 90.6                                  | 89.0                                  | 83.6                                  |
| 1000.0                                 | 91.3                                  | 93.5                                  | 94.1                                  | 92.4                                  | 90.2                                  | 84.9                                  |
| 1250.0                                 | 91.4                                  | 93.7                                  | 95.0                                  | 93.5                                  | 91.0                                  | 86.0                                  |
| 1600.0                                 | 88.6                                  | 91.0                                  | 93.1                                  | 92.0                                  | 91.0                                  | 86.6                                  |
| 2000.0                                 | 85.3                                  | 88.8                                  | 91.3                                  | 91.0                                  | 91.1                                  | 87.0                                  |
| 2500.0                                 | 81.4                                  | 85.9                                  | 88.6                                  | 88.8                                  | 90.5                                  | 86.9                                  |
| 3150.0                                 | 78.3                                  | 83.6                                  | 86.5                                  | 87.1                                  | 89.5                                  | 86.6                                  |
| 4000.0                                 | 77.0                                  | 82.2                                  | 85.4                                  | 85.8                                  | 88.8                                  | 86.2                                  |
| 5000.0                                 | 74.8                                  | 80.2                                  | 83.4                                  | 84.1                                  | 87.7                                  | 85.6                                  |
| 6300.0                                 | 73.1                                  | 78.6                                  | 81.2                                  | 82.6                                  | 86.5                                  | 85.0                                  |
| 8000.0                                 | 71.5                                  | 76.5                                  | 79.5                                  | 80.6                                  | 84.8                                  | 83.8                                  |
| 10000.0                                | 70.5                                  | 74.6                                  | 78.0                                  | 79.4                                  | 83.7                                  | 83.0                                  |
| 12500.0                                | 70.0                                  | 73.4                                  | 76.7                                  | 77.9                                  | 82.5                                  | 82.0                                  |
| 16000.0                                | 68.1                                  | 72.5                                  | 75.7                                  | 76.2                                  | 81.2                                  | 81.1                                  |
| 20000.0                                | 64.9                                  | 70.4                                  | 74.3                                  | 74.4                                  | 79.4                                  | 80.0                                  |
| 25000.0                                | 62.8                                  | 69.4                                  | 73.6                                  | 72.9                                  | 78.2                                  | 79.3                                  |
| 31500.0                                | -7.9                                  | 68.5                                  | 72.2                                  | 71.1                                  | 76.6                                  | 78.3                                  |
| 40000.0                                | -6.6                                  | 68.6                                  | 70.9                                  | 69.7                                  | 75.1                                  | 78.0                                  |
| OVERALL<br>SPL                         | 99.5                                  | 101.1                                 | 101.9                                 | 100.8                                 | 100.6                                 | 97.2                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 67.6                                  | 66.0                                  | 66.1                                  | 64.9                                   | 64.7                                   | 65.0                                   |
| 250.0                                  | 69.9                                  | 67.6                                  | 66.9                                  | 66.2                                   | 66.7                                   | 66.6                                   |
| 315.2                                  | 71.6                                  | 70.2                                  | 69.0                                  | 69.4                                   | 69.0                                   | 70.0                                   |
| 400.0                                  | 74.3                                  | 73.7                                  | 72.3                                  | 71.3                                   | 71.4                                   | 70.5                                   |
| 500.0                                  | 76.1                                  | 75.8                                  | 74.5                                  | 73.4                                   | 73.0                                   | 72.2                                   |
| 630.0                                  | 77.7                                  | 77.8                                  | 76.7                                  | 76.1                                   | 75.3                                   | 74.9                                   |
| 800.0                                  | 79.9                                  | 80.3                                  | 78.8                                  | 78.3                                   | 77.2                                   | 76.5                                   |
| 1000.0                                 | 81.9                                  | 82.1                                  | 80.6                                  | 79.3                                   | 78.9                                   | 78.4                                   |
| 1250.0                                 | 83.2                                  | 83.7                                  | 82.1                                  | 81.0                                   | 80.4                                   | 80.1                                   |
| 1600.0                                 | 83.8                                  | 84.2                                  | 82.9                                  | 81.7                                   | 80.9                                   | 80.6                                   |
| 2000.0                                 | 84.5                                  | 85.2                                  | 83.9                                  | 82.7                                   | 81.6                                   | 81.1                                   |
| 2500.0                                 | 84.5                                  | 85.6                                  | 83.9                                  | 82.5                                   | 81.9                                   | 81.6                                   |
| 3150.0                                 | 84.6                                  | 85.7                                  | 84.0                                  | 83.0                                   | 82.2                                   | 82.2                                   |
| 4000.0                                 | 84.8                                  | 86.0                                  | 84.5                                  | 83.4                                   | 82.4                                   | 82.2                                   |
| 5000.0                                 | 84.8                                  | 85.8                                  | 84.0                                  | 83.0                                   | 82.3                                   | 82.0                                   |
| 6300.0                                 | 84.4                                  | 85.4                                  | 83.4                                  | 82.8                                   | 81.9                                   | 81.8                                   |
| 8000.0                                 | 83.6                                  | 84.7                                  | 82.7                                  | 81.8                                   | 81.2                                   | 81.2                                   |
| 10000.0                                | 83.3                                  | 85.2                                  | 82.3                                  | 82.0                                   | 81.4                                   | 81.7                                   |
| 12500.0                                | 82.7                                  | 83.4                                  | 81.7                                  | 80.6                                   | 80.0                                   | 80.5                                   |
| 16000.0                                | 82.1                                  | 82.9                                  | 81.3                                  | 79.9                                   | 79.7                                   | 79.8                                   |
| 20000.0                                | 81.2                                  | 81.6                                  | 80.5                                  | 78.8                                   | 78.7                                   | 78.5                                   |
| 25000.0                                | 80.6                                  | 80.6                                  | 79.9                                  | 77.9                                   | 78.0                                   | 77.6                                   |
| 31500.0                                | 79.6                                  | 79.1                                  | 78.7                                  | 76.5                                   | 76.6                                   | 76.0                                   |
| 40000.0                                | 79.5                                  | 78.2                                  | 77.6                                  | 75.2                                   | 75.9                                   | 74.6                                   |
| OVERALL<br>SPL                         | 95.8                                  | 96.6                                  | 95.0                                  | 93.9                                   | 93.2                                   | 93.0                                   |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR FRESSURE = 2.88 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 770.00 DEG.F, CHAMBER TEMPERATURE = 54.00 DEG.F  
RELATIVE HUMIDITY = 54.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 155

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.206  
TEMPERATURE RATIO TR = 2.393  
MACH NUMBER MJ = 0.531  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.277  
JET DENSITY RATIO DJ/D0 = 0.439  
JET VELOCITY RATIO VJ/A0 = 0.801  
JET VELOCITY VJ = 890.0 FPS

TR/TJ = 1.051  
DR/D0 = 0.504  
DR/DJ = 1.147  
MASS FLOW = 0.644 POUNDS PER SECOND  
THRUST = 18.15 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO. 11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO. 12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO. 13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO. 14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO. 15 | ANGLE<br>120.0 |
|--|--------------------------|---------------|--------------------------|---------------|--------------------------|---------------|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|
| 200.0                                  | 63.3                     |               | 65.6                     |               | 66.1                     |               | 65.2                     |                | 64.5                     |                | 63.5                     |                |
| 250.0                                  | 66.8                     |               | 67.3                     |               | 66.2                     |               | 66.3                     |                | 66.9                     |                | 67.1                     |                |
| 315.2                                  | 69.4                     |               | 69.6                     |               | 69.2                     |               | 69.6                     |                | 69.8                     |                | 69.7                     |                |
| 400.0                                  | 72.0                     |               | 71.8                     |               | 71.3                     |               | 70.8                     |                | 71.2                     |                | 70.9                     |                |
| 500.0                                  | 75.5                     |               | 74.2                     |               | 74.6                     |               | 73.6                     |                | 73.2                     |                | 72.4                     |                |
| 630.0                                  | 77.9                     |               | 76.8                     |               | 76.1                     |               | 75.7                     |                | 75.6                     |                | 75.4                     |                |
| 800.0                                  | 80.1                     |               | 79.0                     |               | 77.7                     |               | 76.6                     |                | 76.5                     |                | 76.7                     |                |
| 1000.0                                 | 81.8                     |               | 79.8                     |               | 79.0                     |               | 78.2                     |                | 77.7                     |                | 76.8                     |                |
| 1250.0                                 | 83.4                     |               | 81.0                     |               | 81.0                     |               | 80.1                     |                | 79.5                     |                | 78.8                     |                |
| 1600.0                                 | 83.6                     |               | 81.8                     |               | 81.2                     |               | 80.4                     |                | 80.0                     |                | 79.3                     |                |
| 2000.0                                 | 83.9                     |               | 82.9                     |               | 82.0                     |               | 81.2                     |                | 80.4                     |                | 79.9                     |                |
| 2500.0                                 | 83.8                     |               | 82.9                     |               | 82.0                     |               | 81.3                     |                | 80.8                     |                | 80.1                     |                |
| 3150.0                                 | 84.3                     |               | 83.0                     |               | 82.3                     |               | 81.6                     |                | 81.1                     |                | 80.3                     |                |
| 4000.0                                 | 84.2                     |               | 83.1                     |               | 82.6                     |               | 81.5                     |                | 81.1                     |                | 80.2                     |                |
| 5000.0                                 | 83.6                     |               | 82.9                     |               | 82.6                     |               | 81.3                     |                | 81.0                     |                | 80.2                     |                |
| 6300.0                                 | 83.1                     |               | 83.1                     |               | 82.1                     |               | 81.0                     |                | 80.9                     |                | 80.1                     |                |
| 8000.0                                 | 82.6                     |               | 82.9                     |               | 80.5                     |               | 80.2                     |                | 80.0                     |                | 79.3                     |                |
| 10000.0                                | 82.5                     |               | 82.2                     |               | 80.3                     |               | 79.5                     |                | 79.5                     |                | 78.6                     |                |
| 12500.0                                | 82.1                     |               | 80.4                     |               | 80.1                     |               | 79.1                     |                | 79.0                     |                | 78.0                     |                |
| 16000.0                                | 80.4                     |               | 80.0                     |               | 78.5                     |               | 78.4                     |                | 78.4                     |                | 77.4                     |                |
| 20000.0                                | 78.5                     |               | 80.0                     |               | 78.3                     |               | 77.6                     |                | 77.5                     |                | 76.6                     |                |
| 25000.0                                | 78.4                     |               | 78.4                     |               | 77.8                     |               | 76.9                     |                | 77.1                     |                | 76.2                     |                |
| 31500.0                                | 78.0                     |               | 78.6                     |               | 77.5                     |               | 76.3                     |                | 76.6                     |                | 75.9                     |                |
| 40000.0                                | 76.8                     |               | 78.4                     |               | 77.1                     |               | 76.3                     |                | 75.9                     |                | 76.2                     |                |
| OVERALL<br>SPL                         | 95.0                     |               | 94.2                     |               | 93.3                     |               | 92.5                     |                | 92.2                     |                | 91.5                     |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 63.0                                    | 63.7                                    | 64.3                                    | 64.5                                    |
| 250.0                                  | 67.4                                    | 66.5                                    | 66.1                                    | 65.5                                    |
| 315.2                                  | 69.6                                    | 67.6                                    | 67.5                                    | 67.4                                    |
| 400.0                                  | 70.6                                    | 69.9                                    | 69.8                                    | 69.0                                    |
| 500.0                                  | 72.6                                    | 71.8                                    | 70.7                                    | 70.1                                    |
| 630.0                                  | 75.7                                    | 74.5                                    | 72.1                                    | 71.0                                    |
| 800.0                                  | 76.4                                    | 75.2                                    | 73.9                                    | 72.7                                    |
| 1000.0                                 | 76.8                                    | 75.5                                    | 75.0                                    | 73.8                                    |
| 1250.0                                 | 77.9                                    | 76.9                                    | 75.8                                    | 73.7                                    |
| 1600.0                                 | 78.5                                    | 77.4                                    | 76.2                                    | 74.3                                    |
| 2000.0                                 | 79.4                                    | 78.6                                    | 76.8                                    | 74.5                                    |
| 2500.0                                 | 79.8                                    | 78.8                                    | 77.0                                    | 74.5                                    |
| 3150.0                                 | 79.9                                    | 79.1                                    | 77.2                                    | 74.6                                    |
| 4000.0                                 | 80.0                                    | 79.1                                    | 77.5                                    | 74.1                                    |
| 5000.0                                 | 79.8                                    | 78.7                                    | 76.9                                    | 73.6                                    |
| 6300.0                                 | 79.7                                    | 78.3                                    | 76.6                                    | 73.7                                    |
| 8000.0                                 | 78.7                                    | 77.5                                    | 75.4                                    | 72.6                                    |
| 10000.0                                | 77.9                                    | 76.5                                    | 74.5                                    | 71.6                                    |
| 12500.0                                | 77.1                                    | 75.7                                    | 73.5                                    | 70.7                                    |
| 16000.0                                | 76.3                                    | 74.8                                    | 72.7                                    | 69.3                                    |
| 20000.0                                | 75.3                                    | 73.6                                    | 71.5                                    | 68.0                                    |
| 25000.0                                | 74.5                                    | 72.6                                    | 70.7                                    | 66.5                                    |
| 31500.0                                | 73.6                                    | 72.0                                    | 69.9                                    | 65.1                                    |
| 40000.0                                | 73.2                                    | 71.8                                    | 69.2                                    | 64.0                                    |
| OVERALL<br>SPL                         | 90.8                                    | 89.7                                    | 88.0                                    | 85.6                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 3.76 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 882.00 DEG.F, CHAMBER TEMPERATURE = 94.00 DEG.F  
RELATIVE HUMIDITY = 32.0 PERCENT  
GAMMA = 1.360

RUN NUMBER 71

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.264$   
TEMPERATURE RATIO  $T_R = 2.422$   
MACH NUMBER  $M_J = 0.597$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 2.277$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.439$   
JET VELOCITY RATIO  $V_J/A_0 = 0.900$   
JET VELOCITY  $V_J = 1038.6$  FPS

$T_R/T_J = 1.064$   
 $D_R/D_0 = 0.522$   
 $D_R/D_J = 1.188$   
MASS FLOW = 0.724 POUNDS PER SECOND  
THRUST = 22.94 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 80.6                                  | 78.6                                  | 77.4                                  | 74.7                                  | 74.1                                  | 70.8                                  |
| 250.0                                  | 82.9                                  | 83.2                                  | 81.9                                  | 79.6                                  | 77.6                                  | 75.3                                  |
| 315.2                                  | 88.1                                  | 85.8                                  | 85.8                                  | 82.9                                  | 81.0                                  | 78.5                                  |
| 400.0                                  | 90.3                                  | 90.8                                  | 88.2                                  | 86.1                                  | 84.1                                  | 82.1                                  |
| 500.0                                  | 93.8                                  | 92.2                                  | 91.2                                  | 88.4                                  | 87.0                                  | 84.5                                  |
| 630.0                                  | 92.8                                  | 94.0                                  | 94.1                                  | 91.3                                  | 89.6                                  | 86.6                                  |
| 800.0                                  | 96.5                                  | 97.2                                  | 96.8                                  | 94.2                                  | 92.3                                  | 89.3                                  |
| 1000.0                                 | 95.3                                  | 97.8                                  | 98.2                                  | 96.1                                  | 94.4                                  | 91.8                                  |
| 1250.0                                 | 95.6                                  | 98.4                                  | 99.4                                  | 97.5                                  | 96.0                                  | 92.8                                  |
| 1600.0                                 | 94.1                                  | 96.8                                  | 98.4                                  | 96.9                                  | 96.0                                  | 93.7                                  |
| 2000.0                                 | 91.6                                  | 94.9                                  | 96.5                                  | 96.0                                  | 95.6                                  | 93.5                                  |
| 2500.0                                 | 88.0                                  | 91.8                                  | 93.7                                  | 93.8                                  | 95.0                                  | 93.6                                  |
| 3150.0                                 | 84.4                                  | 89.0                                  | 91.2                                  | 92.1                                  | 94.2                                  | 93.3                                  |
| 4000.0                                 | 82.9                                  | 87.1                                  | 89.9                                  | 90.9                                  | 93.7                                  | 92.8                                  |
| 5000.0                                 | 80.6                                  | 84.9                                  | 87.6                                  | 89.1                                  | 92.2                                  | 92.0                                  |
| 6300.0                                 | 79.2                                  | 83.1                                  | 85.8                                  | 87.7                                  | 91.0                                  | 90.9                                  |
| 8000.0                                 | 77.9                                  | 80.9                                  | 83.9                                  | 86.0                                  | 89.4                                  | 89.5                                  |
| 10000.0                                | 77.6                                  | 79.0                                  | 82.6                                  | 84.7                                  | 88.1                                  | 88.5                                  |
| 12500.0                                | 76.9                                  | 77.7                                  | 80.9                                  | 83.3                                  | 86.9                                  | 87.3                                  |
| 16000.0                                | 75.1                                  | 76.6                                  | 79.1                                  | 81.9                                  | 85.6                                  | 86.2                                  |
| 20000.0                                | 72.0                                  | 74.7                                  | 77.3                                  | 80.3                                  | 83.9                                  | 85.0                                  |
| 25000.0                                | 69.9                                  | 73.5                                  | 76.0                                  | 78.9                                  | 82.6                                  | 83.9                                  |
| 31500.0                                | 68.0                                  | 72.3                                  | 74.3                                  | 76.7                                  | 81.0                                  | 82.4                                  |
| 40000.0                                | 66.0                                  | 71.6                                  | 72.4                                  | 75.1                                  | 79.6                                  | 81.2                                  |
| OVERALL<br>SPL                         | 103.7                                 | 105.5                                 | 106.3                                 | 105.0                                 | 105.1                                 | 103.5                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 69.0                                  | 68.5                                  | 67.9                                  | 66.9                                   | 67.1                                   | 67.7                                   |
| 250.0                                  | 72.5                                  | 69.7                                  | 68.6                                  | 68.0                                   | 68.3                                   | 68.3                                   |
| 315.2                                  | 75.4                                  | 72.1                                  | 71.8                                  | 71.0                                   | 70.4                                   | 70.9                                   |
| 400.0                                  | 78.8                                  | 75.4                                  | 74.4                                  | 73.0                                   | 72.6                                   | 72.6                                   |
| 500.0                                  | 80.9                                  | 77.5                                  | 76.7                                  | 75.6                                   | 74.4                                   | 74.6                                   |
| 630.0                                  | 83.3                                  | 79.2                                  | 78.2                                  | 78.3                                   | 76.4                                   | 76.9                                   |
| 800.0                                  | 86.5                                  | 82.2                                  | 80.8                                  | 80.1                                   | 78.9                                   | 79.0                                   |
| 1000.0                                 | 88.3                                  | 84.4                                  | 83.0                                  | 82.1                                   | 80.5                                   | 80.7                                   |
| 1250.0                                 | 89.9                                  | 86.0                                  | 85.0                                  | 83.8                                   | 82.5                                   | 82.7                                   |
| 1600.0                                 | 90.6                                  | 87.0                                  | 85.7                                  | 84.5                                   | 82.9                                   | 83.2                                   |
| 2000.0                                 | 91.4                                  | 88.1                                  | 87.0                                  | 85.7                                   | 83.8                                   | 84.2                                   |
| 2500.0                                 | 91.7                                  | 88.4                                  | 87.3                                  | 86.0                                   | 84.5                                   | 84.6                                   |
| 3150.0                                 | 91.6                                  | 88.8                                  | 87.5                                  | 86.4                                   | 85.0                                   | 85.0                                   |
| 4000.0                                 | 91.4                                  | 89.1                                  | 88.2                                  | 86.7                                   | 85.4                                   | 85.3                                   |
| 5000.0                                 | 91.1                                  | 89.1                                  | 87.6                                  | 86.7                                   | 85.3                                   | 85.3                                   |
| 6300.0                                 | 90.6                                  | 88.9                                  | 87.2                                  | 86.4                                   | 85.4                                   | 85.2                                   |
| 8000.0                                 | 89.6                                  | 88.0                                  | 86.6                                  | 85.6                                   | 84.9                                   | 84.7                                   |
| 10000.0                                | 89.3                                  | 87.7                                  | 86.0                                  | 85.1                                   | 84.6                                   | 84.5                                   |
| 12500.0                                | 88.3                                  | 87.1                                  | 85.4                                  | 84.6                                   | 84.0                                   | 83.9                                   |
| 16000.0                                | 87.4                                  | 86.3                                  | 85.0                                  | 83.7                                   | 83.5                                   | 83.2                                   |
| 20000.0                                | 86.3                                  | 85.1                                  | 83.9                                  | 82.6                                   | 82.6                                   | 81.9                                   |
| 25000.0                                | 85.3                                  | 84.2                                  | 83.3                                  | 81.7                                   | 82.0                                   | 80.8                                   |
| 31500.0                                | 83.5                                  | 82.7                                  | 82.0                                  | 80.3                                   | 81.0                                   | 79.0                                   |
| 40000.0                                | 81.9                                  | 81.8                                  | 80.7                                  | 79.0                                   | 80.6                                   | 77.5                                   |
| OVERALL<br>SPL                         | 102.0                                 | 99.6                                  | 98.3                                  | 97.2                                   | 96.2                                   | 96.1                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 3.71 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 783.00 DEG.F, CHAMBER TEMPERATURE = 54.00 DEG.F  
RELATIVE HUMIDITY = 54.0 PERCENT  
GAMMA = 1.360

RUN NUMBER 156

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.265  
TEMPERATURE RATIO TR = 2.418  
MACH NUMBER MJ = 0.597  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.272  
JET DENSITY RATIO DJ/D0 = 0.440  
JET VELOCITY RATIO VJ/A0 = 0.900  
JET VELOCITY VJ = 1000.5 FPS

TR/TJ = 1.064  
DR/D0 = 0.523  
DR/DJ = 1.189  
MASS FLOW = 0.725 POUNDS PER SECOND  
THRUST = 22.99 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|--|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
|  | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|  | 10             | 82.5  | 11             | 90.0  | 12             | 97.5  | 13             | 105.0 | 14             | 112.5 | 15             | 120.0 |
| 200.0                                  | 66.0           |       | 67.4           |       | 67.7           |       | 66.9           |       | 66.2           |       | 64.2           |       |
| 250.0                                  | 68.4           |       | 68.4           |       | 68.2           |       | 68.1           |       | 68.8           |       | 68.5           |       |
| 315.2                                  | 71.2           |       | 71.3           |       | 71.2           |       | 71.7           |       | 71.8           |       | 71.6           |       |
| 400.0                                  | 73.8           |       | 74.1           |       | 73.6           |       | 73.3           |       | 73.2           |       | 72.8           |       |
| 500.0                                  | 76.8           |       | 76.0           |       | 76.0           |       | 76.0           |       | 75.7           |       | 74.5           |       |
| 630.0                                  | 79.5           |       | 78.9           |       | 78.3           |       | 77.9           |       | 77.4           |       | 77.6           |       |
| 800.0                                  | 81.7           |       | 81.5           |       | 79.8           |       | 78.9           |       | 78.6           |       | 78.3           |       |
| 1000.0                                 | 84.0           |       | 82.5           |       | 81.0           |       | 80.7           |       | 79.7           |       | 78.9           |       |
| 1250.0                                 | 85.4           |       | 83.9           |       | 83.2           |       | 82.6           |       | 81.6           |       | 80.7           |       |
| 1600.0                                 | 86.3           |       | 84.6           |       | 83.6           |       | 83.1           |       | 82.3           |       | 81.6           |       |
| 2000.0                                 | 86.8           |       | 85.7           |       | 84.6           |       | 83.9           |       | 82.8           |       | 82.5           |       |
| 2500.0                                 | 87.0           |       | 86.0           |       | 84.8           |       | 84.3           |       | 83.5           |       | 82.9           |       |
| 3150.0                                 | 87.6           |       | 86.6           |       | 85.4           |       | 84.8           |       | 83.9           |       | 83.2           |       |
| 4000.0                                 | 87.5           |       | 86.8           |       | 85.7           |       | 85.0           |       | 84.2           |       | 83.3           |       |
| 5000.0                                 | 87.1           |       | 86.7           |       | 85.7           |       | 84.8           |       | 84.3           |       | 83.2           |       |
| 6300.0                                 | 86.8           |       | 87.0           |       | 85.5           |       | 84.5           |       | 84.3           |       | 83.2           |       |
| 8000.0                                 | 86.3           |       | 87.0           |       | 84.2           |       | 83.8           |       | 83.3           |       | 82.4           |       |
| 10000.0                                | 86.4           |       | 86.4           |       | 83.8           |       | 83.1           |       | 82.8           |       | 81.7           |       |
| 12500.0                                | 86.0           |       | 84.7           |       | 83.6           |       | 82.6           |       | 82.4           |       | 81.1           |       |
| 16000.0                                | 84.2           |       | 84.2           |       | 82.1           |       | 81.9           |       | 81.6           |       | 80.6           |       |
| 20000.0                                | 82.2           |       | 84.2           |       | 81.9           |       | 81.1           |       | 80.8           |       | 79.9           |       |
| 25000.0                                | 82.2           |       | 82.7           |       | 81.3           |       | 80.4           |       | 80.2           |       | 79.5           |       |
| 31500.0                                | 81.7           |       | 82.8           |       | 80.8           |       | 79.7           |       | 79.7           |       | 79.3           |       |
| 40000.0                                | 80.7           |       | 82.7           |       | 80.4           |       | 79.6           |       | 79.0           |       | 79.4           |       |
| OVERALL<br>SPL                         | 98.2           |       | 97.8           |       | 96.3           |       | 95.6           |       | 95.1           |       | 94.3           |       |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 64.3                                    | 64.5                                    | 65.4                                    | 66.1                                    |
| 250.0                                  | 68.7                                    | 67.8                                    | 67.9                                    | 67.1                                    |
| 315.2                                  | 70.9                                    | 69.9                                    | 69.2                                    | 68.9                                    |
| 400.0                                  | 72.1                                    | 71.6                                    | 71.4                                    | 70.8                                    |
| 500.0                                  | 74.6                                    | 73.2                                    | 72.8                                    | 71.9                                    |
| 630.0                                  | 77.6                                    | 76.8                                    | 74.4                                    | 72.5                                    |
| 800.0                                  | 78.1                                    | 77.1                                    | 76.2                                    | 74.7                                    |
| 1000.0                                 | 78.8                                    | 77.6                                    | 77.5                                    | 75.8                                    |
| 1250.0                                 | 80.3                                    | 79.0                                    | 78.5                                    | 76.3                                    |
| 1600.0                                 | 80.9                                    | 79.6                                    | 78.5                                    | 77.2                                    |
| 2000.0                                 | 81.9                                    | 80.8                                    | 79.7                                    | 77.3                                    |
| 2500.0                                 | 82.4                                    | 81.4                                    | 79.8                                    | 77.5                                    |
| 3150.0                                 | 83.0                                    | 81.8                                    | 80.0                                    | 77.6                                    |
| 4000.0                                 | 83.2                                    | 82.0                                    | 80.4                                    | 77.6                                    |
| 5000.0                                 | 83.0                                    | 81.5                                    | 80.2                                    | 77.2                                    |
| 6300.0                                 | 82.9                                    | 81.6                                    | 79.9                                    | 77.2                                    |
| 8000.0                                 | 82.4                                    | 80.9                                    | 78.9                                    | 76.2                                    |
| 10000.0                                | 81.8                                    | 80.1                                    | 78.0                                    | 75.3                                    |
| 12500.0                                | 80.9                                    | 79.5                                    | 76.9                                    | 74.6                                    |
| 16000.0                                | 80.3                                    | 78.6                                    | 76.1                                    | 73.1                                    |
| 20000.0                                | 79.3                                    | 77.3                                    | 75.0                                    | 71.7                                    |
| 25000.0                                | 78.4                                    | 76.3                                    | 74.1                                    | 70.4                                    |
| 31500.0                                | 77.7                                    | 75.7                                    | 73.4                                    | 69.2                                    |
| 40000.0                                | 77.2                                    | 75.6                                    | 72.7                                    | 68.2                                    |
| OVERALL<br>SPL                         | 93.9                                    | 92.5                                    | 91.0                                    | 88.6                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 6.60 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 947.00 DEG.F, CHAMBER TEMPERATURE = 97.00 DEG.F  
RELATIVE HUMIDITY = 30.0 PERCENT  
GAMMA = 1.355

RUN NUMBER 70

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.464$   
TEMPERATURE RATIO  $T_r = 2.526$   
MACH NUMBER  $M_J = 0.769$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 2.286$   
JET DENSITY RATIO  $D_J/D_0 = 0.437$   
JET VELOCITY RATIO  $V_J/A_0 = 1.163$   
JET VELOCITY  $V_J = 1345.6$  FPS

$T_r/T_J = 1.105$   
 $D_r/D_0 = 0.580$   
 $D_r/D_J = 1.325$   
MASS FLOW = 0.932 POUNDS PER SECOND  
THRUST = 38.15 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 85.8                                  | 85.6                                  | 80.8                                  | 78.1                                  | 76.6                                  | 74.9                                  |
| 250.0                                  | 88.6                                  | 88.3                                  | 87.0                                  | 83.4                                  | 81.6                                  | 78.2                                  |
| 315.2                                  | 92.6                                  | 91.3                                  | 91.0                                  | 87.1                                  | 84.7                                  | 81.6                                  |
| 400.0                                  | 95.7                                  | 96.4                                  | 93.3                                  | 90.9                                  | 88.0                                  | 85.7                                  |
| 500.0                                  | 99.4                                  | 97.9                                  | 96.6                                  | 93.1                                  | 91.0                                  | 87.6                                  |
| 630.0                                  | 97.9                                  | 99.3                                  | 99.8                                  | 96.9                                  | 94.5                                  | 90.8                                  |
| 800.0                                  | 101.8                                 | 103.0                                 | 102.2                                 | 99.3                                  | 96.9                                  | 93.5                                  |
| 1000.0                                 | 101.3                                 | 103.8                                 | 104.3                                 | 102.0                                 | 99.8                                  | 96.1                                  |
| 1250.0                                 | 102.3                                 | 105.3                                 | 106.4                                 | 104.4                                 | 101.8                                 | 98.2                                  |
| 1600.0                                 | 102.3                                 | 105.5                                 | 106.5                                 | 104.6                                 | 102.9                                 | 99.6                                  |
| 2000.0                                 | 101.9                                 | 105.6                                 | 106.6                                 | 104.8                                 | 103.2                                 | 100.1                                 |
| 2500.0                                 | 100.8                                 | 104.7                                 | 105.2                                 | 103.2                                 | 102.3                                 | 100.1                                 |
| 3150.0                                 | 98.2                                  | 102.3                                 | 102.5                                 | 100.8                                 | 100.8                                 | 99.9                                  |
| 4000.0                                 | 94.9                                  | 99.9                                  | 100.2                                 | 99.1                                  | 100.6                                 | 99.6                                  |
| 5000.0                                 | 90.9                                  | 96.5                                  | 97.3                                  | 96.9                                  | 99.3                                  | 99.0                                  |
| 6300.0                                 | 88.1                                  | 94.0                                  | 95.0                                  | 95.4                                  | 98.1                                  | 98.3                                  |
| 8000.0                                 | 85.5                                  | 91.8                                  | 92.6                                  | 93.5                                  | 96.6                                  | 96.9                                  |
| 10000.0                                | 83.3                                  | 90.1                                  | 90.7                                  | 92.2                                  | 95.4                                  | 96.0                                  |
| 12500.0                                | 81.5                                  | 88.3                                  | 88.7                                  | 90.7                                  | 94.2                                  | 94.8                                  |
| 16000.0                                | 79.7                                  | 87.0                                  | 86.7                                  | 89.3                                  | 93.0                                  | 93.8                                  |
| 20000.0                                | 76.5                                  | 84.9                                  | 84.5                                  | 87.6                                  | 91.3                                  | 92.4                                  |
| 25000.0                                | 74.5                                  | 83.4                                  | 82.5                                  | 86.1                                  | 89.8                                  | 91.1                                  |
| 31500.0                                | 72.4                                  | 81.9                                  | 79.7                                  | 84.2                                  | 87.7                                  | 89.3                                  |
| 40000.0                                | 3.4                                   | 81.3                                  | 76.7                                  | 82.4                                  | 85.9                                  | 88.2                                  |
| OVERALL<br>SPL                         | 110.9                                 | 113.8                                 | 114.3                                 | 112.5                                 | 111.7                                 | 109.9                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 72.1                                  | 72.5                                  | 73.2                                  | 71.8                                   | 71.0                                   | 71.0                                   |
| 250.0                                  | 76.1                                  | 74.3                                  | 74.1                                  | 73.0                                   | 73.3                                   | 72.7                                   |
| 315.2                                  | 77.6                                  | 77.1                                  | 76.6                                  | 76.3                                   | 75.0                                   | 75.0                                   |
| 400.0                                  | 82.4                                  | 80.0                                  | 79.6                                  | 78.1                                   | 78.1                                   | 76.7                                   |
| 500.0                                  | 83.9                                  | 82.4                                  | 81.0                                  | 79.6                                   | 79.2                                   | 78.7                                   |
| 630.0                                  | 87.3                                  | 85.4                                  | 83.7                                  | 82.2                                   | 81.8                                   | 80.6                                   |
| 800.0                                  | 90.1                                  | 87.5                                  | 85.9                                  | 84.2                                   | 84.1                                   | 82.9                                   |
| 1000.0                                 | 92.2                                  | 89.6                                  | 88.1                                  | 86.5                                   | 85.5                                   | 84.9                                   |
| 1250.0                                 | 94.2                                  | 91.5                                  | 89.9                                  | 88.5                                   | 87.7                                   | 86.9                                   |
| 1600.0                                 | 95.8                                  | 93.0                                  | 91.3                                  | 89.5                                   | 88.5                                   | 87.5                                   |
| 2000.0                                 | 97.1                                  | 94.4                                  | 92.4                                  | 91.0                                   | 89.7                                   | 88.6                                   |
| 2500.0                                 | 97.6                                  | 95.0                                  | 93.1                                  | 91.7                                   | 90.3                                   | 89.6                                   |
| 3150.0                                 | 98.0                                  | 95.7                                  | 93.8                                  | 92.0                                   | 91.1                                   | 90.1                                   |
| 4000.0                                 | 98.2                                  | 96.4                                  | 94.6                                  | 92.5                                   | 91.6                                   | 90.6                                   |
| 5000.0                                 | 98.0                                  | 96.3                                  | 94.3                                  | 92.5                                   | 91.6                                   | 90.7                                   |
| 6300.0                                 | 97.8                                  | 96.3                                  | 94.1                                  | 92.7                                   | 91.7                                   | 91.1                                   |
| 8000.0                                 | 96.8                                  | 95.7                                  | 93.6                                  | 92.0                                   | 91.2                                   | 90.7                                   |
| 10000.0                                | 96.3                                  | 95.3                                  | 93.1                                  | 91.7                                   | 91.0                                   | 90.7                                   |
| 12500.0                                | 95.5                                  | 94.8                                  | 92.7                                  | 91.1                                   | 90.4                                   | 90.4                                   |
| 16000.0                                | 94.6                                  | 94.4                                  | 92.4                                  | 90.5                                   | 89.9                                   | 89.9                                   |
| 20000.0                                | 93.4                                  | 93.2                                  | 91.6                                  | 89.6                                   | 89.0                                   | 88.8                                   |
| 25000.0                                | 92.1                                  | 92.2                                  | 91.0                                  | 88.6                                   | 88.1                                   | 87.8                                   |
| 31500.0                                | 90.2                                  | 90.7                                  | 89.8                                  | 87.1                                   | 86.9                                   | 86.2                                   |
| 40000.0                                | 88.4                                  | 89.6                                  | 88.4                                  | 85.5                                   | 85.9                                   | 84.7                                   |
| OVERALL<br>SPL                         | 108.3                                 | 106.7                                 | 104.8                                 | 103.1                                  | 102.3                                  | 101.7                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 6.50 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 846.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 48.0 PERCENT  
GAMMA = 1.355

RUN NUMBER 157

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.464$   
TEMPERATURE RATIO  $TR = 2.521$   
MACH NUMBER  $MJ = 0.769$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.282$   
JET DENSITY RATIO  $DJ/D_0 = 0.438$   
JET VELOCITY RATIO  $VJ/A_0 = 1.162$   
JET VELOCITY  $VJ = 1296.6$  FPS

$TR/TJ = 1.105$   
 $DR/D_0 = 0.581$   
 $DR/DJ = 1.325$   
MASS FLOW = 0.933 POUNDS PER SECOND  
THRUST = 38.16 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 69.6                        | 71.4                        | 71.9                        | 71.0                        | 69.4                        | 68.5                        |
| 250.0                                  | 72.1                        | 72.8                        | 71.3                        | 71.0                        | 70.8                        | 71.7                        |
| 315.2                                  | 74.4                        | 74.1                        | 74.6                        | 74.8                        | 74.7                        | 74.7                        |
| 400.0                                  | 77.8                        | 77.4                        | 77.0                        | 77.0                        | 76.5                        | 76.7                        |
| 500.0                                  | 80.5                        | 79.7                        | 79.7                        | 79.9                        | 79.0                        | 78.4                        |
| 630.0                                  | 82.8                        | 82.5                        | 82.1                        | 82.1                        | 81.6                        | 81.9                        |
| 800.0                                  | 85.4                        | 85.0                        | 84.3                        | 82.8                        | 82.6                        | 83.2                        |
| 1000.0                                 | 87.8                        | 86.8                        | 84.9                        | 84.5                        | 83.4                        | 83.3                        |
| 1250.0                                 | 89.9                        | 88.3                        | 87.3                        | 86.3                        | 85.7                        | 85.0                        |
| 1600.0                                 | 91.0                        | 89.0                        | 88.0                        | 87.3                        | 86.6                        | 86.0                        |
| 2000.0                                 | 91.9                        | 90.7                        | 89.2                        | 88.4                        | 87.3                        | 86.8                        |
| 2500.0                                 | 92.2                        | 91.2                        | 89.6                        | 88.8                        | 88.1                        | 87.5                        |
| 3150.0                                 | 93.0                        | 91.7                        | 90.5                        | 89.8                        | 88.8                        | 88.2                        |
| 4000.0                                 | 93.4                        | 92.2                        | 90.9                        | 90.0                        | 89.1                        | 88.4                        |
| 5000.0                                 | 93.0                        | 92.3                        | 91.1                        | 90.0                        | 89.4                        | 88.5                        |
| 6300.0                                 | 92.9                        | 92.9                        | 91.3                        | 90.2                        | 89.5                        | 88.9                        |
| 8000.0                                 | 93.0                        | 93.4                        | 90.2                        | 89.9                        | 88.9                        | 88.2                        |
| 10000.0                                | 93.2                        | 93.0                        | 89.8                        | 89.2                        | 88.5                        | 87.5                        |
| 12500.0                                | 93.0                        | 91.5                        | 89.9                        | 88.8                        | 88.0                        | 87.1                        |
| 16000.0                                | 91.5                        | 90.8                        | 88.4                        | 88.0                        | 87.3                        | 86.6                        |
| 20000.0                                | 89.7                        | 91.1                        | 88.2                        | 87.1                        | 86.5                        | 86.1                        |
| 25000.0                                | 89.7                        | 90.1                        | 87.8                        | 86.6                        | 86.2                        | 86.0                        |
| 31500.0                                | 88.9                        | 89.8                        | 87.2                        | 85.9                        | 85.9                        | 85.6                        |
| 40000.0                                | 87.5                        | 89.6                        | 86.7                        | 85.8                        | 85.0                        | 85.8                        |
| OVERALL<br>SPL                         | 104.1                       | 103.6                       | 101.7                       | 100.9                       | 100.1                       | 99.6                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|--|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
|  | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|  | 16             | 127.5 | 17             | 135.0 | 18             | 142.5 | 19             | 150.0 |
| 200.0                                  | 67.0           |       | 67.8           |       | 69.0           |       | 70.5           |       |
| 250.0                                  | 71.0           |       | 71.9           |       | 72.0           |       | 71.6           |       |
| 315.2                                  | 73.6           |       | 73.9           |       | 73.2           |       | 72.6           |       |
| 400.0                                  | 75.2           |       | 75.3           |       | 74.8           |       | 74.8           |       |
| 500.0                                  | 78.4           |       | 77.8           |       | 77.0           |       | 76.6           |       |
| 630.0                                  | 82.2           |       | 81.4           |       | 79.0           |       | 77.0           |       |
| 800.0                                  | 82.3           |       | 81.6           |       | 80.5           |       | 78.8           |       |
| 1000.0                                 | 82.6           |       | 81.8           |       | 81.5           |       | 80.3           |       |
| 1250.0                                 | 84.2           |       | 84.2           |       | 83.5           |       | 81.5           |       |
| 1600.0                                 | 85.3           |       | 84.8           |       | 83.9           |       | 82.5           |       |
| 2000.0                                 | 86.5           |       | 86.4           |       | 85.4           |       | 83.0           |       |
| 2500.0                                 | 87.1           |       | 86.7           |       | 85.5           |       | 83.6           |       |
| 3150.0                                 | 87.7           |       | 87.4           |       | 86.0           |       | 84.1           |       |
| 4000.0                                 | 88.3           |       | 87.6           |       | 86.7           |       | 84.4           |       |
| 5000.0                                 | 88.4           |       | 87.3           |       | 86.2           |       | 84.3           |       |
| 6300.0                                 | 88.6           |       | 87.4           |       | 86.0           |       | 84.5           |       |
| 8000.0                                 | 88.0           |       | 87.1           |       | 85.5           |       | 84.1           |       |
| 10000.0                                | 87.4           |       | 86.3           |       | 84.7           |       | 83.3           |       |
| 12500.0                                | 86.9           |       | 85.8           |       | 83.8           |       | 82.7           |       |
| 16000.0                                | 86.2           |       | 85.1           |       | 83.0           |       | 81.2           |       |
| 20000.0                                | 85.3           |       | 84.0           |       | 81.8           |       | 79.8           |       |
| 25000.0                                | 84.9           |       | 83.2           |       | 81.4           |       | 78.5           |       |
| 31500.0                                | 84.0           |       | 82.4           |       | 80.5           |       | 77.3           |       |
| 40000.0                                | 83.5           |       | 82.1           |       | 79.6           |       | 76.1           |       |
| OVERALL                                |                |       |                |       |                |       |                |       |
| SPL                                    | 99.1           |       | 98.3           |       | 96.9           |       | 95.1           |       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 9.07 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 990.00 DEG.F, CHAMBER TEMPERATURE = 98.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
 $\gamma = 1.353$

RUN NUMBER 69

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.638$   
TEMPERATURE RATIO  $T_R = 2.599$   
MACH NUMBER  $M_J = 0.882$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 2.285$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.438$   
JET VELOCITY RATIO  $V_J/A_0 = 1.334$   
JET VELOCITY  $V_J = 1544.1$  FPS

$T_R/T_J = 1.137$   
 $D_R/D_0 = 0.630$   
 $D_R/D_J = 1.440$   
MASS FLOW = 1.069 POUNDS PER SECOND  
THRUST = 50.17 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 88.7                                  | 88.7                                  | 85.5                                  | 81.2                                  | 0.0                                   | 78.2                                  |
| 250.0                                  | 91.9                                  | 92.0                                  | 90.8                                  | 86.6                                  | 85.0                                  | 81.5                                  |
| 315.2                                  | 97.1                                  | 94.6                                  | 93.6                                  | 90.0                                  | 87.4                                  | 84.2                                  |
| 400.0                                  | 99.3                                  | 99.4                                  | 96.4                                  | 93.8                                  | 91.8                                  | 87.7                                  |
| 500.0                                  | 102.2                                 | 101.2                                 | 99.7                                  | 96.5                                  | 94.2                                  | 91.0                                  |
| 630.0                                  | 101.3                                 | 103.3                                 | 103.2                                 | 100.1                                 | 97.9                                  | 94.2                                  |
| 800.0                                  | 105.2                                 | 106.6                                 | 105.5                                 | 103.6                                 | 101.5                                 | 97.2                                  |
| 1000.0                                 | 104.5                                 | 107.0                                 | 108.0                                 | 106.4                                 | 103.9                                 | 100.0                                 |
| 1250.0                                 | 105.9                                 | 108.5                                 | 109.9                                 | 108.5                                 | 106.7                                 | 102.2                                 |
| 1600.0                                 | 106.2                                 | 109.0                                 | 110.2                                 | 109.5                                 | 108.3                                 | 104.2                                 |
| 2000.0                                 | 106.9                                 | 110.1                                 | 111.2                                 | 110.4                                 | 109.5                                 | 105.4                                 |
| 2500.0                                 | 107.1                                 | 110.7                                 | 111.5                                 | 110.2                                 | 109.4                                 | 105.5                                 |
| 3150.0                                 | 106.9                                 | 110.5                                 | 110.5                                 | 108.6                                 | 108.1                                 | 105.2                                 |
| 4000.0                                 | 105.4                                 | 109.3                                 | 108.7                                 | 107.1                                 | 107.3                                 | 104.8                                 |
| 5000.0                                 | 102.6                                 | 106.8                                 | 105.6                                 | 104.4                                 | 105.5                                 | 104.3                                 |
| 6300.0                                 | 100.1                                 | 104.6                                 | 103.5                                 | 102.8                                 | 104.3                                 | 103.7                                 |
| 8000.0                                 | 97.1                                  | 102.1                                 | 101.0                                 | 100.9                                 | 102.6                                 | 102.4                                 |
| 10000.0                                | 94.5                                  | 99.9                                  | 99.0                                  | 99.3                                  | 101.4                                 | 101.6                                 |
| 12500.0                                | 92.0                                  | 97.7                                  | 96.9                                  | 97.8                                  | 100.4                                 | 100.6                                 |
| 16000.0                                | 89.9                                  | 95.9                                  | 95.0                                  | 96.5                                  | 99.2                                  | 99.6                                  |
| 20000.0                                | 87.4                                  | 93.8                                  | 93.0                                  | 94.7                                  | 97.5                                  | 98.1                                  |
| 25000.0                                | 85.5                                  | 92.1                                  | 91.3                                  | 93.0                                  | 96.0                                  | 96.9                                  |
| 31500.0                                | 83.7                                  | 90.1                                  | 89.1                                  | 90.7                                  | 94.2                                  | 95.2                                  |
| 40000.0                                | 82.0                                  | 88.6                                  | 87.0                                  | 88.8                                  | 92.2                                  | 93.9                                  |
| OVERALL<br>SPL                         | 116.1                                 | 119.2                                 | 119.5                                 | 118.2                                 | 117.7                                 | 115.0                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 74.8                                  | 75.0                                  | 74.0                                  | 73.8                                   | 74.3                                   | 74.1                                   |
| 250.0                                  | 78.4                                  | 77.2                                  | 76.3                                  | 75.8                                   | 76.4                                   | 75.7                                   |
| 315.2                                  | 80.6                                  | 79.4                                  | 78.3                                  | 78.0                                   | 78.2                                   | 77.4                                   |
| 400.0                                  | 84.9                                  | 82.1                                  | 81.2                                  | 80.3                                   | 80.8                                   | 79.7                                   |
| 500.0                                  | 86.9                                  | 84.1                                  | 82.6                                  | 80.9                                   | 81.9                                   | 81.6                                   |
| 630.0                                  | 90.1                                  | 87.1                                  | 85.4                                  | 84.7                                   | 84.0                                   | 83.0                                   |
| 800.0                                  | 93.1                                  | 90.2                                  | 88.1                                  | 86.9                                   | 86.7                                   | 85.6                                   |
| 1000.0                                 | 95.6                                  | 92.3                                  | 90.5                                  | 88.6                                   | 88.0                                   | 87.1                                   |
| 1250.0                                 | 97.5                                  | 94.4                                  | 92.5                                  | 90.8                                   | 89.8                                   | 89.5                                   |
| 1600.0                                 | 99.4                                  | 96.1                                  | 93.7                                  | 92.2                                   | 91.2                                   | 90.4                                   |
| 2000.0                                 | 100.6                                 | 97.7                                  | 95.5                                  | 93.5                                   | 92.6                                   | 91.4                                   |
| 2500.0                                 | 101.4                                 | 98.5                                  | 96.6                                  | 94.5                                   | 93.4                                   | 92.5                                   |
| 3150.0                                 | 101.9                                 | 99.3                                  | 97.1                                  | 95.3                                   | 94.4                                   | 93.4                                   |
| 4000.0                                 | 102.3                                 | 100.1                                 | 98.0                                  | 96.2                                   | 94.9                                   | 93.9                                   |
| 5000.0                                 | 102.4                                 | 100.2                                 | 97.9                                  | 96.3                                   | 95.2                                   | 94.2                                   |
| 6300.0                                 | 102.4                                 | 100.5                                 | 98.0                                  | 96.7                                   | 95.3                                   | 94.5                                   |
| 8000.0                                 | 101.8                                 | 100.0                                 | 97.6                                  | 96.1                                   | 95.0                                   | 94.1                                   |
| 10000.0                                | 101.4                                 | 99.8                                  | 97.3                                  | 96.0                                   | 95.0                                   | 94.3                                   |
| 12500.0                                | 100.6                                 | 99.3                                  | 96.9                                  | 95.7                                   | 94.7                                   | 93.9                                   |
| 16000.0                                | 99.8                                  | 99.1                                  | 96.8                                  | 95.2                                   | 94.5                                   | 93.5                                   |
| 20000.0                                | 98.5                                  | 98.1                                  | 95.9                                  | 94.1                                   | 93.6                                   | 92.4                                   |
| 25000.0                                | 97.3                                  | 97.2                                  | 95.3                                  | 93.1                                   | 92.8                                   | 91.4                                   |
| 31500.0                                | 95.4                                  | 95.7                                  | 93.8                                  | 91.6                                   | 91.6                                   | 89.9                                   |
| 40000.0                                | 93.4                                  | 94.4                                  | 92.4                                  | 89.8                                   | 90.7                                   | 88.3                                   |
| OVERALL<br>SPL                         | 112.6                                 | 110.7                                 | 108.5                                 | 106.8                                  | 106.0                                  | 105.0                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.93 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 878.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 52.0 PERCENT  
GAMMA = 1.353

RUN NUMBER 158

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.638  
TEMPERATURE RATIO TR = 2.588  
MACH NUMBER MJ = 0.882  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.275  
JET DENSITY RATIO DJ/D0 = 0.439  
JET VELOCITY RATIO VJ/A0 = 1.331  
JET VELOCITY VJ = 1483.3 FPS

TR/TJ = 1.137  
DR/D0 = 0.633  
DR/DJ = 1.440  
MASS FLOW = 1.071 POUNDS PER SECOND  
THRUST = 50.17 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 72.1                                   | 74.1                                   | 75.0                                   | 73.8                                    | 72.7                                    | 70.6                                    |
| 250.0                                  | 75.2                                   | 74.7                                   | 74.2                                   | 73.0                                    | 73.2                                    | 73.2                                    |
| 315.2                                  | 76.8                                   | 76.8                                   | 76.7                                   | 77.0                                    | 76.8                                    | 77.2                                    |
| 400.0                                  | 80.1                                   | 79.8                                   | 79.2                                   | 79.7                                    | 79.2                                    | 79.5                                    |
| 500.0                                  | 83.6                                   | 82.1                                   | 81.7                                   | 82.0                                    | 82.1                                    | 81.5                                    |
| 630.0                                  | 85.4                                   | 84.6                                   | 84.5                                   | 84.5                                    | 84.9                                    | 85.0                                    |
| 800.0                                  | 87.9                                   | 87.6                                   | 86.2                                   | 85.5                                    | 85.8                                    | 86.0                                    |
| 1000.0                                 | 90.4                                   | 89.7                                   | 87.3                                   | 86.8                                    | 86.0                                    | 86.0                                    |
| 1250.0                                 | 92.8                                   | 91.2                                   | 89.5                                   | 89.2                                    | 88.3                                    | 87.7                                    |
| 1600.0                                 | 94.1                                   | 92.1                                   | 90.6                                   | 89.9                                    | 89.3                                    | 88.8                                    |
| 2000.0                                 | 95.5                                   | 93.5                                   | 91.9                                   | 91.2                                    | 90.0                                    | 89.7                                    |
| 2500.0                                 | 95.5                                   | 94.2                                   | 92.7                                   | 91.9                                    | 91.1                                    | 90.6                                    |
| 3150.0                                 | 96.3                                   | 95.0                                   | 93.4                                   | 93.2                                    | 91.8                                    | 91.3                                    |
| 4000.0                                 | 96.9                                   | 95.5                                   | 94.1                                   | 93.4                                    | 92.2                                    | 91.5                                    |
| 5000.0                                 | 96.7                                   | 95.8                                   | 94.4                                   | 93.5                                    | 92.6                                    | 91.8                                    |
| 6300.0                                 | 96.7                                   | 96.4                                   | 94.4                                   | 93.9                                    | 93.0                                    | 92.3                                    |
| 8000.0                                 | 96.6                                   | 96.8                                   | 93.3                                   | 93.4                                    | 92.2                                    | 91.6                                    |
| 10000.0                                | 96.8                                   | 96.6                                   | 92.7                                   | 92.9                                    | 91.9                                    | 91.0                                    |
| 12500.0                                | 96.8                                   | 95.3                                   | 92.9                                   | 92.5                                    | 91.7                                    | 90.7                                    |
| 16000.0                                | 95.6                                   | 94.5                                   | 91.2                                   | 91.9                                    | 91.0                                    | 90.2                                    |
| 20000.0                                | 93.7                                   | 94.9                                   | 90.8                                   | 91.1                                    | 90.2                                    | 89.7                                    |
| 25000.0                                | 93.3                                   | 93.5                                   | 89.7                                   | 90.6                                    | 89.7                                    | 89.5                                    |
| 31500.0                                | 92.7                                   | 93.6                                   | 88.8                                   | 90.1                                    | 89.2                                    | 89.4                                    |
| 40000.0                                | 91.8                                   | 93.5                                   | 87.9                                   | 90.2                                    | 88.5                                    | 89.8                                    |
| OVERALL<br>SPL                         | 107.7                                  | 107.0                                  | 104.5                                  | 104.3                                   | 103.4                                   | 102.9                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 69.0                        | 68.8                        | 70.8                        | 71.4                        |
| 250.0                                  | 73.3                        | 73.3                        | 74.2                        | 73.4                        |
| 315.2                                  | 76.1                        | 75.4                        | 74.7                        | 74.8                        |
| 400.0                                  | 77.6                        | 76.2                        | 76.5                        | 77.0                        |
| 500.0                                  | 80.7                        | 79.7                        | 79.6                        | 78.0                        |
| 630.0                                  | 85.5                        | 84.0                        | 81.4                        | 78.2                        |
| 800.0                                  | 85.4                        | 84.4                        | 82.9                        | 80.4                        |
| 1000.0                                 | 85.4                        | 83.6                        | 83.8                        | 82.2                        |
| 1250.0                                 | 86.3                        | 86.2                        | 85.8                        | 83.3                        |
| 1600.0                                 | 87.8                        | 87.0                        | 86.5                        | 84.8                        |
| 2000.0                                 | 89.4                        | 89.0                        | 87.8                        | 85.5                        |
| 2500.0                                 | 89.9                        | 89.1                        | 88.1                        | 86.1                        |
| 3150.0                                 | 90.7                        | 89.8                        | 88.7                        | 86.8                        |
| 4000.0                                 | 91.3                        | 90.2                        | 89.4                        | 87.4                        |
| 5000.0                                 | 91.5                        | 90.2                        | 89.1                        | 87.1                        |
| 6300.0                                 | 91.7                        | 90.6                        | 89.3                        | 87.8                        |
| 8000.0                                 | 91.4                        | 90.3                        | 88.4                        | 87.0                        |
| 10000.0                                | 90.8                        | 89.7                        | 87.8                        | 86.3                        |
| 12500.0                                | 90.4                        | 89.1                        | 87.0                        | 85.7                        |
| 16000.0                                | 89.9                        | 88.6                        | 86.2                        | 84.2                        |
| 20000.0                                | 89.0                        | 87.6                        | 84.9                        | 82.7                        |
| 25000.0                                | 88.2                        | 86.6                        | 84.2                        | 81.3                        |
| 31500.0                                | 87.5                        | 86.0                        | 83.4                        | 80.2                        |
| 40000.0                                | 86.9                        | 85.9                        | 82.6                        | 79.1                        |
| OVERALL<br>SPL                         | 102.2                       | 101.2                       | 99.7                        | 97.8                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 11.72 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1030.00 DEG.F, CHAMBER TEMPERATURE = 98.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.352

RUN NUMBER 68

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.824$   
TEMPERATURE RATIO  $TR = 2.670$   
MACH NUMBER  $MJ = 0.981$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.283$   
JET DENSITY RATIO  $DJ/D_0 = 0.438$   
JET VELOCITY RATIO  $VJ/A_0 = 1.483$   
JET VELOCITY  $VJ = 1716.7$  FPS

$TR/TJ = 1.169$   
 $DR/D_0 = 0.683$   
 $DR/DJ = 1.560$   
MASS FLOW = 1.189 POUNDS PER SECOND  
THRUST = 62.05 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 92.1                                  | 93.5                                  | 87.0                                  | 84.2                                  | 83.1                                  | 10.0                                  |
| 250.0                                  | 95.1                                  | 96.3                                  | 93.5                                  | 89.6                                  | 87.9                                  | 83.6                                  |
| 315.2                                  | 99.5                                  | 98.5                                  | 96.5                                  | 93.2                                  | 89.9                                  | 86.3                                  |
| 400.0                                  | 102.2                                 | 102.2                                 | 100.0                                 | 96.8                                  | 94.9                                  | 90.6                                  |
| 500.0                                  | 105.4                                 | 104.1                                 | 103.2                                 | 100.1                                 | 97.1                                  | 92.5                                  |
| 630.0                                  | 104.2                                 | 105.9                                 | 106.6                                 | 103.4                                 | 100.8                                 | 96.4                                  |
| 800.0                                  | 108.4                                 | 109.7                                 | 109.5                                 | 106.5                                 | 104.3                                 | 100.1                                 |
| 1000.0                                 | 107.7                                 | 110.1                                 | 111.6                                 | 109.4                                 | 107.8                                 | 103.2                                 |
| 1250.0                                 | 108.9                                 | 111.3                                 | 113.6                                 | 111.6                                 | 110.3                                 | 105.4                                 |
| 1600.0                                 | 109.2                                 | 112.1                                 | 114.1                                 | 113.2                                 | 112.1                                 | 107.7                                 |
| 2000.0                                 | 109.9                                 | 113.4                                 | 114.9                                 | 114.6                                 | 113.5                                 | 109.0                                 |
| 2500.0                                 | 110.6                                 | 114.6                                 | 115.9                                 | 114.8                                 | 114.3                                 | 109.7                                 |
| 3150.0                                 | 110.7                                 | 115.1                                 | 116.2                                 | 114.9                                 | 113.4                                 | 109.7                                 |
| 4000.0                                 | 110.6                                 | 115.4                                 | 116.5                                 | 114.5                                 | 112.9                                 | 109.1                                 |
| 5000.0                                 | 109.1                                 | 113.9                                 | 114.7                                 | 112.5                                 | 111.1                                 | 108.6                                 |
| 6300.0                                 | 107.2                                 | 112.0                                 | 112.8                                 | 111.0                                 | 109.9                                 | 108.1                                 |
| 8000.0                                 | 104.9                                 | 109.8                                 | 110.7                                 | 109.2                                 | 108.4                                 | 107.1                                 |
| 10000.0                                | 103.0                                 | 108.0                                 | 108.8                                 | 107.7                                 | 107.3                                 | 106.3                                 |
| 12500.0                                | 101.1                                 | 106.3                                 | 106.8                                 | 106.1                                 | 106.1                                 | 105.4                                 |
| 16000.0                                | 99.3                                  | 104.5                                 | 104.8                                 | 104.6                                 | 105.0                                 | 104.6                                 |
| 20000.0                                | 97.2                                  | 102.4                                 | 103.1                                 | 102.7                                 | 103.3                                 | 103.2                                 |
| 25000.0                                | 94.9                                  | 100.6                                 | 101.4                                 | 101.0                                 | 101.8                                 | 101.9                                 |
| 31500.0                                | 92.4                                  | 98.6                                  | 99.3                                  | 98.9                                  | 99.9                                  | 100.5                                 |
| 40000.0                                | 90.6                                  | 97.1                                  | 97.2                                  | 97.1                                  | 97.8                                  | 99.1                                  |
| OVERALL<br>SPL                         | 120.2                                 | 123.9                                 | 125.0                                 | 123.6                                 | 122.5                                 | 119.2                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 78.2                                  | 77.4                                  | 77.3                                  | 76.4                                   | 75.2                                   | 74.1                                   |
| 250.0                                  | 81.4                                  | 79.9                                  | 78.6                                  | 78.1                                   | 78.1                                   | 77.2                                   |
| 315.2                                  | 82.7                                  | 80.7                                  | 80.1                                  | 80.1                                   | 79.3                                   | 78.2                                   |
| 400.0                                  | 86.9                                  | 84.3                                  | 83.5                                  | 82.6                                   | 82.5                                   | 81.2                                   |
| 500.0                                  | 89.3                                  | 86.1                                  | 84.7                                  | 83.2                                   | 82.8                                   | 82.2                                   |
| 630.0                                  | 91.4                                  | 88.7                                  | 87.5                                  | 86.7                                   | 86.1                                   | 84.8                                   |
| 800.0                                  | 95.3                                  | 91.4                                  | 89.9                                  | 88.8                                   | 88.4                                   | 87.8                                   |
| 1000.0                                 | 97.5                                  | 94.0                                  | 91.9                                  | 90.9                                   | 89.5                                   | 89.0                                   |
| 1250.0                                 | 100.0                                 | 96.2                                  | 93.8                                  | 92.9                                   | 91.4                                   | 91.3                                   |
| 1600.0                                 | 102.2                                 | 98.0                                  | 95.7                                  | 94.1                                   | 93.2                                   | 91.9                                   |
| 2000.0                                 | 103.7                                 | 99.8                                  | 97.3                                  | 95.6                                   | 94.5                                   | 93.5                                   |
| 2500.0                                 | 104.5                                 | 101.1                                 | 98.5                                  | 96.6                                   | 95.6                                   | 94.6                                   |
| 3150.0                                 | 104.9                                 | 101.9                                 | 99.1                                  | 97.4                                   | 96.4                                   | 95.6                                   |
| 4000.0                                 | 105.5                                 | 103.0                                 | 100.4                                 | 98.3                                   | 97.1                                   | 96.2                                   |
| 5000.0                                 | 105.8                                 | 103.5                                 | 100.3                                 | 98.6                                   | 97.4                                   | 96.9                                   |
| 6300.0                                 | 105.8                                 | 104.0                                 | 100.6                                 | 99.2                                   | 97.7                                   | 97.4                                   |
| 8000.0                                 | 105.2                                 | 103.6                                 | 100.4                                 | 98.7                                   | 97.6                                   | 97.4                                   |
| 10000.0                                | 104.9                                 | 103.6                                 | 100.2                                 | 98.7                                   | 97.5                                   | 97.5                                   |
| 12500.0                                | 104.1                                 | 103.2                                 | 100.1                                 | 98.4                                   | 97.1                                   | 97.3                                   |
| 16000.0                                | 103.3                                 | 102.9                                 | 100.2                                 | 98.0                                   | 97.2                                   | 97.1                                   |
| 20000.0                                | 102.3                                 | 101.9                                 | 99.6                                  | 97.2                                   | 96.3                                   | 96.0                                   |
| 25000.0                                | 101.0                                 | 100.6                                 | 99.0                                  | 96.2                                   | 95.4                                   | 95.1                                   |
| 31500.0                                | 99.2                                  | 99.3                                  | 97.9                                  | 94.8                                   | 94.2                                   | 93.7                                   |
| 40000.0                                | 97.3                                  | 98.1                                  | 96.5                                  | 93.1                                   | 93.4                                   | 92.1                                   |
| OVERALL<br>SPL                         | 115.9                                 | 114.0                                 | 111.3                                 | 109.4                                  | 108.3                                  | 107.9                                  |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 11.55 PSI, ATMOSPHERIC PRESSURE = 14.00 PSI  
RESERVOIR TEMPERATURE = 918.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 52.0 PERCENT  
GAMMA = 1.352

RUN NUMBER 159

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.825$   
TEMPERATURE RATIO  $TR = 2.665$   
MACH NUMBER  $MJ = 0.982$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 2.279$   
JET DENSITY RATIO  $DJ/D0 = 0.439$   
JET VELOCITY RATIO  $VJ/A0 = 1.482$   
JET VELOCITY  $VJ = 1651.5$  FPS

$TR/T0 = 1.170$   
 $DR/D0 = 0.685$   
 $DR/DJ = 1.560$   
MASS FLOW = 1.190 POUNDS PER SECOND  
THRUST = 62.10 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 73.7                                   | 76.4                                   | 76.9                                   | 75.9                                    | 74.7                                    | 71.5                                    |
| 250.0                                  | 76.7                                   | 77.3                                   | 76.0                                   | 74.4                                    | 74.6                                    | 73.7                                    |
| 315.2                                  | 78.3                                   | 78.6                                   | 78.0                                   | 77.8                                    | 78.2                                    | 78.2                                    |
| 400.0                                  | 81.5                                   | 80.8                                   | 81.0                                   | 80.6                                    | 81.2                                    | 80.6                                    |
| 500.0                                  | 84.7                                   | 83.8                                   | 83.4                                   | 84.0                                    | 83.6                                    | 83.3                                    |
| 630.0                                  | 86.7                                   | 86.0                                   | 86.4                                   | 86.5                                    | 86.8                                    | 86.9                                    |
| 800.0                                  | 89.2                                   | 88.8                                   | 88.7                                   | 87.4                                    | 87.5                                    | 87.8                                    |
| 1000.0                                 | 91.3                                   | 90.7                                   | 89.3                                   | 88.2                                    | 87.4                                    | 87.2                                    |
| 1250.0                                 | 94.3                                   | 93.2                                   | 91.3                                   | 90.7                                    | 89.8                                    | 89.4                                    |
| 1600.0                                 | 95.8                                   | 93.4                                   | 92.6                                   | 91.5                                    | 91.3                                    | 90.3                                    |
| 2000.0                                 | 97.4                                   | 95.1                                   | 94.1                                   | 93.0                                    | 92.0                                    | 91.3                                    |
| 2500.0                                 | 97.5                                   | 96.1                                   | 94.7                                   | 93.9                                    | 93.2                                    | 92.1                                    |
| 3150.0                                 | 98.2                                   | 97.0                                   | 95.6                                   | 95.1                                    | 93.9                                    | 93.2                                    |
| 4000.0                                 | 98.9                                   | 97.5                                   | 96.2                                   | 95.5                                    | 94.5                                    | 93.6                                    |
| 5000.0                                 | 99.1                                   | 97.8                                   | 96.7                                   | 95.5                                    | 95.0                                    | 94.2                                    |
| 6300.0                                 | 99.2                                   | 98.5                                   | 97.0                                   | 95.9                                    | 95.2                                    | 94.6                                    |
| 8000.0                                 | 99.0                                   | 99.2                                   | 96.1                                   | 95.5                                    | 94.5                                    | 94.1                                    |
| 10000.0                                | 99.5                                   | 99.2                                   | 95.7                                   | 95.3                                    | 94.3                                    | 93.7                                    |
| 12500.0                                | 99.7                                   | 98.0                                   | 96.1                                   | 95.0                                    | 94.2                                    | 93.2                                    |
| 16000.0                                | 98.8                                   | 97.2                                   | 94.9                                   | 94.4                                    | 93.6                                    | 92.6                                    |
| 20000.0                                | 97.0                                   | 97.5                                   | 94.7                                   | 93.7                                    | 92.6                                    | 92.0                                    |
| 25000.0                                | 96.4                                   | 96.5                                   | 94.1                                   | 93.1                                    | 92.2                                    | 91.6                                    |
| 31500.0                                | 96.0                                   | 96.5                                   | 94.1                                   | 92.5                                    | 91.8                                    | 91.5                                    |
| 40000.0                                | 95.0                                   | 96.4                                   | 93.9                                   | 92.6                                    | 91.1                                    | 91.6                                    |
| OVERALL<br>SPL                         | 110.1                                  | 109.3                                  | 107.3                                  | 106.5                                   | 105.6                                   | 105.0                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>16 127.5 | MICRO<br>PHONE<br>NO. ANGLE<br>17 135.0 | MICRO<br>PHONE<br>NO. ANGLE<br>18 142.5 | MICRO<br>PHONE<br>NO. ANGLE<br>19 150.0 |
|--|---|---|---|---|
| 200.0                                  | 70.9                                    | 70.1                                    | 72.6                                    | 72.6                                    |
| 250.0                                  | 74.5                                    | 74.7                                    | 75.3                                    | 75.6                                    |
| 315.2                                  | 77.8                                    | 76.3                                    | 76.4                                    | 76.6                                    |
| 400.0                                  | 79.6                                    | 77.7                                    | 77.4                                    | 78.4                                    |
| 500.0                                  | 83.2                                    | 82.0                                    | 81.0                                    | 80.3                                    |
| 630.0                                  | 87.8                                    | 86.5                                    | 83.6                                    | 80.1                                    |
| 800.0                                  | 87.7                                    | 86.5                                    | 85.0                                    | 82.0                                    |
| 1000.0                                 | 87.4                                    | 85.3                                    | 85.6                                    | 84.0                                    |
| 1250.0                                 | 88.2                                    | 88.1                                    | 87.8                                    | 85.4                                    |
| 1600.0                                 | 89.5                                    | 89.0                                    | 88.5                                    | 87.1                                    |
| 2000.0                                 | 91.0                                    | 91.0                                    | 89.9                                    | 87.6                                    |
| 2500.0                                 | 91.6                                    | 91.2                                    | 90.4                                    | 88.6                                    |
| 3150.0                                 | 92.6                                    | 91.9                                    | 91.4                                    | 89.6                                    |
| 4000.0                                 | 93.1                                    | 92.5                                    | 92.0                                    | 90.2                                    |
| 5000.0                                 | 93.4                                    | 92.2                                    | 92.0                                    | 90.3                                    |
| 6300.0                                 | 93.8                                    | 92.7                                    | 92.3                                    | 90.9                                    |
| 8000.0                                 | 93.5                                    | 92.6                                    | 91.7                                    | 90.4                                    |
| 10000.0                                | 93.2                                    | 91.9                                    | 91.0                                    | 89.6                                    |
| 12500.0                                | 92.7                                    | 91.6                                    | 90.4                                    | 88.7                                    |
| 16000.0                                | 92.2                                    | 90.7                                    | 89.7                                    | 87.1                                    |
| 20000.0                                | 91.4                                    | 89.7                                    | 88.5                                    | 85.5                                    |
| 25000.0                                | 90.7                                    | 88.8                                    | 87.6                                    | 84.0                                    |
| 31500.0                                | 90.0                                    | 88.2                                    | 86.9                                    | 82.8                                    |
| 40000.0                                | 89.5                                    | 88.2                                    | 86.2                                    | 81.9                                    |
| OVERALL<br>SPL                         | 104.3                                   | 103.3                                   | 102.5                                   | 100.6                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.41 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1150.00 DEG.F, CHAMBER TEMPERATURE = 102.00 DEG.F  
RELATIVE HUMIDITY = 31.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 58

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.029$   
TEMPERATURE RATIO  $TR = 2.865$   
MACH NUMBER  $MJ = 0.206$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.844$   
JET DENSITY RATIO  $DJ/D_0 = 0.352$   
JET VELOCITY RATIO  $VJ/A_0 = 0.347$   
JET VELOCITY  $VJ = 403.6$  FPS

$TR/TJ = 1.007$   
 $DR/D_0 = 0.359$   
 $DR/DJ = 1.021$   
MASS FLOW = 0.224 POUNDS PER SECOND  
THRUST = 2.73 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 60.4                                  | 59.0                                  | 58.3                                  | 56.7                                  | 57.0                                  | 55.5                                  |
| 250.0                                  | 63.0                                  | 62.7                                  | 62.5                                  | 60.8                                  | 60.3                                  | 58.5                                  |
| 315.2                                  | 66.7                                  | 65.5                                  | 66.3                                  | 63.5                                  | 63.2                                  | 61.9                                  |
| 400.0                                  | 68.3                                  | 69.5                                  | 66.8                                  | 65.2                                  | 65.4                                  | 63.8                                  |
| 500.0                                  | 70.1                                  | 68.6                                  | 67.8                                  | 66.7                                  | 66.2                                  | 64.2                                  |
| 630.0                                  | 66.4                                  | 67.5                                  | 68.5                                  | 66.8                                  | 66.3                                  | 64.8                                  |
| 800.0                                  | 67.9                                  | 69.2                                  | 68.6                                  | 66.9                                  | 67.0                                  | 65.7                                  |
| 1000.0                                 | 64.8                                  | 66.9                                  | 67.9                                  | 66.7                                  | 66.9                                  | 66.0                                  |
| 1250.0                                 | 62.9                                  | 66.2                                  | 66.9                                  | 65.8                                  | 66.4                                  | 65.7                                  |
| 1600.0                                 | 59.6                                  | 63.1                                  | 64.9                                  | 64.3                                  | 65.2                                  | 64.8                                  |
| 2000.0                                 | 57.0                                  | 61.4                                  | 63.0                                  | 63.1                                  | 64.3                                  | 63.8                                  |
| 2500.0                                 | 54.4                                  | 58.8                                  | 60.6                                  | 61.2                                  | 62.7                                  | 63.0                                  |
| 3150.0                                 | 51.4                                  | 56.4                                  | 58.5                                  | 59.6                                  | 61.6                                  | 62.3                                  |
| 4000.0                                 | 54.2                                  | 56.2                                  | 57.3                                  | 58.1                                  | 60.7                                  | 61.5                                  |
| 5000.0                                 | 53.3                                  | 55.0                                  | 55.6                                  | 55.9                                  | 59.3                                  | 60.4                                  |
| 6300.0                                 | 52.8                                  | 53.1                                  | 54.1                                  | 54.7                                  | 58.2                                  | 59.8                                  |
| 8000.0                                 | 52.0                                  | 51.2                                  | 52.8                                  | 53.5                                  | 57.0                                  | 58.6                                  |
| 10000.0                                | 52.8                                  | 50.8                                  | 52.5                                  | 52.7                                  | 56.6                                  | 58.3                                  |
| 12500.0                                | 50.3                                  | 49.5                                  | 50.9                                  | 51.7                                  | 56.0                                  | 57.8                                  |
| 16000.0                                | 48.5                                  | 49.3                                  | 50.4                                  | 51.4                                  | 55.6                                  | 57.5                                  |
| 20000.0                                | 46.7                                  | 48.3                                  | 49.4                                  | 50.4                                  | 54.5                                  | 56.6                                  |
| 25000.0                                | 47.2                                  | 49.0                                  | 49.1                                  | 49.8                                  | 54.0                                  | 55.8                                  |
| 31500.0                                | 48.5                                  | 50.6                                  | 48.9                                  | 49.5                                  | 53.5                                  | 54.4                                  |
| 40000.0                                | 50.8                                  | 53.5                                  | 50.4                                  | 51.4                                  | 55.0                                  | 53.7                                  |
| OVERALL<br>SPL                         | 76.4                                  | 77.1                                  | 77.2                                  | 76.0                                  | 76.5                                  | 75.9                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 54.4                                  | 54.2                                  | 54.3                                  | 53.9                                   | 55.5                                   | 55.5                                   |
| 250.0                                  | 56.9                                  | 56.2                                  | 55.0                                  | 55.0                                   | 55.9                                   | 54.8                                   |
| 315.2                                  | 59.9                                  | 59.3                                  | 57.5                                  | 57.7                                   | 57.7                                   | 57.5                                   |
| 400.0                                  | 62.1                                  | 60.2                                  | 58.7                                  | 58.7                                   | 58.4                                   | 57.0                                   |
| 500.0                                  | 63.1                                  | 61.4                                  | 60.6                                  | 60.0                                   | 60.1                                   | 58.7                                   |
| 630.0                                  | 63.7                                  | 62.1                                  | 61.0                                  | 61.2                                   | 61.0                                   | 60.1                                   |
| 800.0                                  | 65.2                                  | 63.8                                  | 62.7                                  | 62.1                                   | 62.2                                   | 61.0                                   |
| 1000.0                                 | 64.8                                  | 63.6                                  | 62.8                                  | 62.4                                   | 62.0                                   | 60.9                                   |
| 1250.0                                 | 64.4                                  | 63.7                                  | 62.3                                  | 62.4                                   | 62.0                                   | 61.4                                   |
| 1600.0                                 | 64.1                                  | 63.1                                  | 61.7                                  | 61.6                                   | 61.4                                   | 60.7                                   |
| 2000.0                                 | 63.1                                  | 62.8                                  | 61.2                                  | 61.1                                   | 61.1                                   | 60.4                                   |
| 2500.0                                 | 62.5                                  | 62.0                                  | 60.5                                  | 60.7                                   | 60.5                                   | 59.8                                   |
| 3150.0                                 | 62.0                                  | 61.9                                  | 60.0                                  | 60.2                                   | 60.3                                   | 59.9                                   |
| 4000.0                                 | 61.1                                  | 61.7                                  | 60.1                                  | 59.8                                   | 59.8                                   | 59.8                                   |
| 5000.0                                 | 60.3                                  | 61.0                                  | 59.1                                  | 59.1                                   | 59.4                                   | 59.5                                   |
| 6300.0                                 | 60.0                                  | 60.8                                  | 58.8                                  | 59.2                                   | 59.2                                   | 59.4                                   |
| 8000.0                                 | 58.9                                  | 60.1                                  | 58.4                                  | 58.6                                   | 58.8                                   | 58.8                                   |
| 10000.0                                | 58.5                                  | 59.9                                  | 58.2                                  | 58.3                                   | 58.6                                   | 58.9                                   |
| 12500.0                                | 57.9                                  | 59.5                                  | 58.1                                  | 58.1                                   | 58.1                                   | 58.7                                   |
| 16000.0                                | 57.6                                  | 59.5                                  | 58.4                                  | 57.8                                   | 58.3                                   | 58.8                                   |
| 20000.0                                | 56.9                                  | 58.1                                  | 57.6                                  | 57.0                                   | 57.4                                   | 57.7                                   |
| 25000.0                                | 56.2                                  | 57.4                                  | 57.2                                  | 56.1                                   | 56.8                                   | 56.8                                   |
| 31500.0                                | 55.3                                  | 55.9                                  | 55.7                                  | 54.5                                   | 55.4                                   | 55.0                                   |
| 40000.0                                | 57.1                                  | 54.9                                  | 54.7                                  | 53.6                                   | 55.2                                   | 53.8                                   |
| OVERALL<br>SPL                         | 75.1                                  | 74.7                                  | 73.4                                  | 73.2                                   | 73.3                                   | 72.8                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.41 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1035.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 223

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.029  
TEMPERATURE RATIO TR = 2.875  
MACH NUMBER MJ = 0.206  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.854  
JET DENSITY RATIO DJ/D0 = 0.350  
JET VELOCITY RATIO VJ/A0 = 0.348  
JET VELOCITY VJ = 389.5 FPS

TR/TJ = 1.007  
DR/D0 = 0.358  
DR/DJ = 1.021  
MASS FLOW = 0.224 POUNDS PER SECOND  
THRUST = 2.74 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO.<br>10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO.<br>11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO.<br>12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO.<br>13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO.<br>14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO.<br>15 | ANGLE<br>120.0 |
|--|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|---------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|----------------|
| 200.0                                  | 53.8                        |               | 55.9                        |               | 57.0                        |               | 56.6                        |                | 55.6                        |                | 56.0                        |                |
| 250.0                                  | 58.5                        |               | 59.3                        |               | 58.8                        |               | 56.9                        |                | 57.6                        |                | 56.7                        |                |
| 315.2                                  | 62.1                        |               | 61.6                        |               | 61.5                        |               | 60.2                        |                | 60.7                        |                | 60.9                        |                |
| 400.0                                  | 61.8                        |               | 62.4                        |               | 60.8                        |               | 60.1                        |                | 61.3                        |                | 60.4                        |                |
| 500.0                                  | 61.5                        |               | 59.9                        |               | 60.6                        |               | 59.5                        |                | 59.6                        |                | 59.4                        |                |
| 630.0                                  | 62.1                        |               | 61.6                        |               | 61.0                        |               | 59.9                        |                | 60.4                        |                | 60.2                        |                |
| 800.0                                  | 63.4                        |               | 62.8                        |               | 61.9                        |               | 61.0                        |                | 61.5                        |                | 61.4                        |                |
| 1000.0                                 | 62.6                        |               | 62.1                        |               | 61.5                        |               | 60.4                        |                | 61.0                        |                | 60.7                        |                |
| 1250.0                                 | 61.4                        |               | 61.6                        |               | 61.5                        |               | 60.1                        |                | 60.5                        |                | 59.8                        |                |
| 1600.0                                 | 61.2                        |               | 61.4                        |               | 60.8                        |               | 59.4                        |                | 60.1                        |                | 59.8                        |                |
| 2000.0                                 | 60.3                        |               | 61.1                        |               | 60.4                        |               | 59.3                        |                | 59.6                        |                | 59.6                        |                |
| 2500.0                                 | 59.6                        |               | 60.2                        |               | 59.6                        |               | 58.8                        |                | 59.4                        |                | 59.2                        |                |
| 3150.0                                 | 58.8                        |               | 59.9                        |               | 59.2                        |               | 58.8                        |                | 59.5                        |                | 59.3                        |                |
| 4000.0                                 | 58.3                        |               | 59.6                        |               | 59.1                        |               | 58.6                        |                | 59.1                        |                | 58.9                        |                |
| 5000.0                                 | 57.6                        |               | 59.1                        |               | 59.0                        |               | 58.5                        |                | 59.1                        |                | 58.7                        |                |
| 6300.0                                 | 57.7                        |               | 59.6                        |               | 58.8                        |               | 58.4                        |                | 59.3                        |                | 58.8                        |                |
| 8000.0                                 | 57.8                        |               | 59.7                        |               | 57.5                        |               | 57.9                        |                | 58.6                        |                | 58.0                        |                |
| 10000.0                                | 58.3                        |               | 59.7                        |               | 57.5                        |               | 57.5                        |                | 58.2                        |                | 57.5                        |                |
| 12500.0                                | 58.6                        |               | 58.5                        |               | 57.6                        |               | 57.5                        |                | 58.3                        |                | 57.3                        |                |
| 16000.0                                | 57.7                        |               | 58.5                        |               | 56.7                        |               | 57.4                        |                | 58.2                        |                | 57.0                        |                |
| 20000.0                                | 56.9                        |               | 58.8                        |               | 57.4                        |               | 56.9                        |                | 57.9                        |                | 56.9                        |                |
| 25000.0                                | 56.0                        |               | 57.1                        |               | 56.0                        |               | 55.8                        |                | 56.7                        |                | 56.2                        |                |
| 31500.0                                | 55.9                        |               | 56.8                        |               | 55.4                        |               | 55.1                        |                | 55.9                        |                | 55.8                        |                |
| 40000.0                                | 54.6                        |               | 56.2                        |               | 54.7                        |               | 55.4                        |                | 55.1                        |                | 56.0                        |                |
| OVERALL<br>SPL                         | 73.5                        |               | 73.9                        |               | 73.2                        |               | 72.4                        |                | 73.0                        |                | 72.6                        |                |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 56.3                        | 57.9                        | 55.2                        | 57.9                        |
| 250.0                                  | 58.1                        | 57.0                        | 56.6                        | 56.7                        |
| 315.2                                  | 61.3                        | 60.6                        | 58.3                        | 58.6                        |
| 400.0                                  | 60.4                        | 59.8                        | 59.2                        | 60.5                        |
| 500.0                                  | 59.8                        | 58.6                        | 58.7                        | 58.5                        |
| 630.0                                  | 60.6                        | 59.3                        | 58.5                        | 58.1                        |
| 800.0                                  | 61.4                        | 60.1                        | 59.3                        | 58.6                        |
| 1000.0                                 | 60.5                        | 59.0                        | 57.7                        | 57.8                        |
| 1250.0                                 | 59.3                        | 58.5                        | 56.4                        | 55.6                        |
| 1600.0                                 | 59.0                        | 57.0                        | 55.2                        | 54.7                        |
| 2000.0                                 | 59.2                        | 57.7                        | 54.8                        | 53.5                        |
| 2500.0                                 | 59.2                        | 57.1                        | 54.4                        | 52.9                        |
| 3150.0                                 | 59.1                        | 57.3                        | 53.8                        | 52.6                        |
| 4000.0                                 | 58.7                        | 56.6                        | 53.7                        | 51.8                        |
| 5000.0                                 | 58.6                        | 56.0                        | 53.1                        | 50.8                        |
| 6300.0                                 | 58.5                        | 55.6                        | 52.5                        | 50.4                        |
| 8000.0                                 | 57.9                        | 54.7                        | 51.0                        | 48.9                        |
| 10000.0                                | 57.4                        | 53.6                        | 50.3                        | 47.3                        |
| 12500.0                                | 56.9                        | 52.7                        | 49.5                        | 46.2                        |
| 16000.0                                | 56.8                        | 51.8                        | 49.0                        | 45.3                        |
| 20000.0                                | 57.0                        | 51.2                        | 50.1                        | 47.6                        |
| 25000.0                                | 54.8                        | 48.8                        | 45.3                        | 41.3                        |
| 31500.0                                | 54.0                        | 47.7                        | 43.8                        | 41.0                        |
| 40000.0                                | 53.5                        | 48.1                        | 43.8                        | 45.2                        |
| OVERALL<br>SPL                         | 72.5                        | 70.7                        | 69.0                        | 68.8                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.54 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1183.00 DEG.F, CHAMBER TEMPERATURE = 105.00 DEG.F  
RELATIVE HUMIDITY = 27.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 59

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.038  
TEMPERATURE RATIO TR = 2.908  
MACH NUMBER MJ = 0.236  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.880  
JET DENSITY RATIO DJ/D0 = 0.347  
JET VELOCITY RATIO VJ/A0 = 0.400  
JET VELOCITY VJ = 466.6 FPS

TR/TJ = 1.010  
DR/D0 = 0.357  
DR/DJ = 1.028  
MASS FLOW = 0.255 POUNDS PER SECOND  
THRUST = 3.59 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 62.2  |       | 60.5  |       | 60.0  | 58.7  |
| 250.0   | 64.6  |       | 65.4  |       | 64.8  | 62.8  |
| 315.2   | 69.0  |       | 67.9  |       | 68.2  | 66.2  |
| 400.0   | 70.6  |       | 71.8  |       | 69.3  | 67.8  |
| 500.0   | 73.0  |       | 71.5  |       | 70.9  | 69.5  |
| 630.0   | 69.8  |       | 70.8  |       | 72.1  | 69.8  |
| 800.0   | 71.2  |       | 72.3  |       | 71.9  | 70.1  |
| 1000.0  | 68.5  |       | 69.7  |       | 71.2  | 69.8  |
| 1250.0  | 66.5  |       | 69.2  |       | 70.6  | 69.6  |
| 1600.0  | 62.8  |       | 66.2  |       | 68.3  | 67.6  |
| 2000.0  | 60.5  |       | 64.2  |       | 66.6  | 66.8  |
| 2500.0  | 57.9  |       | 61.7  |       | 63.9  | 65.0  |
| 3150.0  | 55.0  |       | 59.3  |       | 61.6  | 63.1  |
| 4000.0  | 56.4  |       | 58.8  |       | 59.5  | 61.5  |
| 5000.0  | 56.1  |       | 57.8  |       | 57.4  | 59.6  |
| 6300.0  | 55.2  |       | 55.8  |       | 55.5  | 58.0  |
| 8000.0  | 54.9  |       | 54.4  |       | 54.5  | 56.9  |
| 10000.0 | 53.9  |       | 52.2  |       | 53.5  | 55.9  |
| 12500.0 | 52.6  |       | 52.1  |       | 52.5  | 55.2  |
| 16000.0 | 50.8  |       | 51.6  |       | 51.7  | 54.6  |
| 20000.0 | 48.2  |       | 50.3  |       | 50.5  | 53.5  |
| 25000.0 | 47.5  |       | 50.2  |       | 49.9  | 52.8  |
| 31500.0 | 47.8  |       | 50.9  |       | 49.1  | 51.3  |
| 40000.0 | 49.4  |       | 56.7  |       | 50.0  | 51.8  |
| OVERALL |       |       |       |       |       |       |
| SPL     | 79.3  |       | 80.0  |       | 80.3  | 79.1  |
|         |       |       |       |       | 80.0  | 78.6  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 56.0                                  | 55.6                                  | 55.4                                  | 55.4                                   | 56.2                                   | 56.4                                   |
| 250.0                                  | 58.4                                  | 57.7                                  | 57.0                                  | 56.1                                   | 57.3                                   | 56.5                                   |
| 315.2                                  | 61.0                                  | 60.1                                  | 58.9                                  | 58.8                                   | 59.2                                   | 59.0                                   |
| 400.0                                  | 63.5                                  | 62.1                                  | 60.8                                  | 60.2                                   | 60.1                                   | 59.3                                   |
| 500.0                                  | 65.4                                  | 63.5                                  | 62.7                                  | 61.9                                   | 61.7                                   | 61.0                                   |
| 630.0                                  | 66.1                                  | 64.9                                  | 63.9                                  | 63.6                                   | 62.9                                   | 62.2                                   |
| 800.0                                  | 67.3                                  | 66.3                                  | 65.2                                  | 64.8                                   | 64.5                                   | 63.2                                   |
| 1000.0                                 | 67.8                                  | 66.6                                  | 65.7                                  | 65.3                                   | 64.9                                   | 63.6                                   |
| 1250.0                                 | 67.4                                  | 66.7                                  | 65.6                                  | 65.0                                   | 65.0                                   | 63.9                                   |
| 1600.0                                 | 66.8                                  | 66.2                                  | 65.2                                  | 64.7                                   | 64.4                                   | 63.1                                   |
| 2000.0                                 | 66.3                                  | 65.9                                  | 65.0                                  | 64.8                                   | 64.2                                   | 63.2                                   |
| 2500.0                                 | 65.4                                  | 65.2                                  | 63.9                                  | 64.3                                   | 63.6                                   | 62.8                                   |
| 3150.0                                 | 64.9                                  | 64.7                                  | 63.5                                  | 64.1                                   | 63.6                                   | 63.0                                   |
| 4000.0                                 | 64.1                                  | 64.1                                  | 63.1                                  | 63.7                                   | 62.4                                   | 62.5                                   |
| 5000.0                                 | 63.3                                  | 63.6                                  | 62.2                                  | 63.3                                   | 62.3                                   | 62.5                                   |
| 6300.0                                 | 62.4                                  | 63.0                                  | 61.5                                  | 62.9                                   | 61.9                                   | 62.4                                   |
| 8000.0                                 | 61.9                                  | 62.7                                  | 61.4                                  | 62.7                                   | 61.9                                   | 62.0                                   |
| 10000.0                                | 61.3                                  | 62.4                                  | 60.8                                  | 62.4                                   | 61.6                                   | 61.8                                   |
| 12500.0                                | 60.9                                  | 62.0                                  | 60.6                                  | 62.2                                   | 61.4                                   | 61.7                                   |
| 16000.0                                | 60.4                                  | 61.9                                  | 60.5                                  | 61.6                                   | 61.6                                   | 61.6                                   |
| 20000.0                                | 59.3                                  | 61.0                                  | 59.7                                  | 60.3                                   | 60.5                                   | 60.4                                   |
| 25000.0                                | 58.6                                  | 60.1                                  | 59.3                                  | 59.3                                   | 59.8                                   | 59.3                                   |
| 31500.0                                | 57.1                                  | 58.0                                  | 57.7                                  | 56.9                                   | 58.0                                   | 57.0                                   |
| 40000.0                                | 57.1                                  | 56.7                                  | 56.2                                  | 55.0                                   | 56.8                                   | 55.3                                   |
| OVERALL<br>SPL                         | 77.7                                  | 77.3                                  | 76.2                                  | 76.3                                   | 75.9                                   | 75.4                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.54 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1040.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 224

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.038$   
TEMPERATURE RATIO  $TR = 2.885$   
MACH NUMBER  $MJ = 0.236$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.857$   
JET DENSITY RATIO  $DJ/D_0 = 0.350$   
JET VELOCITY RATIO  $VJ/A_0 = 0.399$   
JET VELOCITY  $VJ = 446.5$  FPS

$TR/TJ = 1.010$   
 $DR/D_0 = 0.360$   
 $DR/DJ = 1.028$   
MASS FLOW = 0.256 POUNDS PER SECOND  
THRUST = 3.60 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 55.7                                   | 57.3                                   | 58.8                                   | 58.8                                    | 57.8                                    | 56.5                                    |
| 250.0                                  | 60.2                                   | 60.3                                   | 60.1                                   | 59.5                                    | 59.2                                    | 59.0                                    |
| 315.2                                  | 62.9                                   | 63.3                                   | 63.5                                   | 62.4                                    | 62.1                                    | 62.9                                    |
| 400.0                                  | 63.9                                   | 63.7                                   | 63.0                                   | 63.1                                    | 62.4                                    | 62.2                                    |
| 500.0                                  | 64.6                                   | 64.0                                   | 63.2                                   | 63.3                                    | 63.2                                    | 62.1                                    |
| 630.0                                  | 65.6                                   | 64.4                                   | 63.8                                   | 63.8                                    | 63.5                                    | 63.2                                    |
| 800.0                                  | 66.8                                   | 66.3                                   | 64.9                                   | 65.2                                    | 64.6                                    | 64.2                                    |
| 1000.0                                 | 67.1                                   | 65.4                                   | 65.1                                   | 64.5                                    | 64.0                                    | 63.9                                    |
| 1250.0                                 | 66.4                                   | 65.0                                   | 64.6                                   | 64.1                                    | 63.9                                    | 63.6                                    |
| 1600.0                                 | 65.6                                   | 64.7                                   | 64.7                                   | 63.9                                    | 63.8                                    | 63.0                                    |
| 2000.0                                 | 65.0                                   | 64.7                                   | 64.4                                   | 64.2                                    | 63.4                                    | 63.0                                    |
| 2500.0                                 | 64.4                                   | 64.2                                   | 63.8                                   | 63.7                                    | 63.2                                    | 62.6                                    |
| 3150.0                                 | 63.9                                   | 63.3                                   | 63.0                                   | 63.6                                    | 62.9                                    | 62.5                                    |
| 4000.0                                 | 63.2                                   | 62.7                                   | 62.8                                   | 63.1                                    | 62.7                                    | 62.0                                    |
| 5000.0                                 | 62.1                                   | 62.2                                   | 62.6                                   | 62.6                                    | 62.4                                    | 61.7                                    |
| 6300.0                                 | 61.8                                   | 62.6                                   | 62.3                                   | 62.7                                    | 62.8                                    | 61.9                                    |
| 8000.0                                 | 61.7                                   | 62.7                                   | 61.0                                   | 62.1                                    | 62.1                                    | 61.0                                    |
| 10000.0                                | 62.1                                   | 62.5                                   | 61.0                                   | 61.7                                    | 61.8                                    | 60.8                                    |
| 12500.0                                | 62.3                                   | 61.4                                   | 61.1                                   | 61.7                                    | 61.8                                    | 60.5                                    |
| 16000.0                                | 61.3                                   | 61.3                                   | 60.4                                   | 61.1                                    | 61.5                                    | 60.1                                    |
| 20000.0                                | 60.1                                   | 61.6                                   | 60.8                                   | 60.8                                    | 61.3                                    | 60.0                                    |
| 25000.0                                | 60.4                                   | 60.6                                   | 60.1                                   | 60.4                                    | 61.0                                    | 59.6                                    |
| 31500.0                                | 60.6                                   | 60.7                                   | 60.0                                   | 60.0                                    | 60.8                                    | 59.3                                    |
| 40000.0                                | 59.4                                   | 60.4                                   | 59.9                                   | 60.1                                    | 60.0                                    | 59.5                                    |
| OVERALL<br>SPL                         | 77.3                                   | 76.9                                   | 76.5                                   | 76.5                                    | 76.2                                    | 75.6                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 56.4  |       | 58.5  |       | 57.6  |       | 58.4  |       |  |
| 250.0   | 59.8  |       | 58.8  |       | 58.9  |       | 58.3  |       |  |
| 315.2   | 62.6  |       | 61.6  |       | 60.1  |       | 59.8  |       |  |
| 400.0   | 62.0  |       | 61.3  |       | 60.9  |       | 62.1  |       |  |
| 500.0   | 62.7  |       | 61.7  |       | 61.6  |       | 61.4  |       |  |
| 630.0   | 63.4  |       | 63.1  |       | 61.0  |       | 61.6  |       |  |
| 800.0   | 63.5  |       | 63.2  |       | 62.0  |       | 61.9  |       |  |
| 1000.0  | 63.2  |       | 62.5  |       | 61.8  |       | 60.9  |       |  |
| 1250.0  | 62.8  |       | 62.0  |       | 61.0  |       | 58.8  |       |  |
| 1600.0  | 62.2  |       | 61.0  |       | 60.1  |       | 57.9  |       |  |
| 2000.0  | 62.6  |       | 61.3  |       | 60.1  |       | 57.5  |       |  |
| 2500.0  | 62.5  |       | 61.1  |       | 59.3  |       | 56.6  |       |  |
| 3150.0  | 62.2  |       | 60.7  |       | 59.0  |       | 56.1  |       |  |
| 4000.0  | 61.8  |       | 60.3  |       | 58.8  |       | 55.3  |       |  |
| 5000.0  | 61.6  |       | 59.6  |       | 58.3  |       | 54.5  |       |  |
| 6300.0  | 61.4  |       | 59.4  |       | 57.5  |       | 53.7  |       |  |
| 8000.0  | 60.6  |       | 58.5  |       | 56.3  |       | 52.0  |       |  |
| 10000.0 | 60.1  |       | 57.5  |       | 55.4  |       | 50.6  |       |  |
| 12500.0 | 59.8  |       | 56.7  |       | 54.6  |       | 49.4  |       |  |
| 16000.0 | 59.3  |       | 56.0  |       | 54.0  |       | 48.4  |       |  |
| 20000.0 | 59.3  |       | 55.0  |       | 53.7  |       | 49.0  |       |  |
| 25000.0 | 58.1  |       | 53.4  |       | 51.4  |       | 44.4  |       |  |
| 31500.0 | 57.7  |       | 52.5  |       | 50.4  |       | 43.6  |       |  |
| 40000.0 | 57.4  |       | 52.3  |       | 49.6  |       | 46.1  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 75.2  |       | 73.8  |       | 72.6  |       | 71.4  |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.85 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1185.00 DEG.F, CHAMBER TEMPERATURE = 110.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 60

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.060  
TEMPERATURE RATIO TR = 2.877  
MACH NUMBER MJ = 0.295  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.835  
JET DENSITY RATIO DJ/D0 = 0.353  
JET VELOCITY RATIO VJ/A0 = 0.497  
JET VELOCITY VJ = 581.1 FPS

TR/TJ = 1.015  
DR/D0 = 0.368  
DR/DJ = 1.044  
MASS FLOW = 0.321 POUNDS PER SECOND  
THRUST = 5.61 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 66.1                                  | 65.6                                  | 64.3                                  | 62.7                                  | 62.1                                  | 60.4                                  |
| 250.0                                  | 68.1                                  | 69.5                                  | 69.7                                  | 67.3                                  | 65.5                                  | 63.2                                  |
| 315.2                                  | 72.6                                  | 71.5                                  | 72.8                                  | 70.2                                  | 68.4                                  | 67.0                                  |
| 400.0                                  | 75.7                                  | 76.0                                  | 74.1                                  | 73.2                                  | 71.4                                  | 69.3                                  |
| 500.0                                  | 77.6                                  | 76.5                                  | 76.4                                  | 75.5                                  | 72.8                                  | 71.2                                  |
| 630.0                                  | 76.2                                  | 77.1                                  | 78.6                                  | 76.2                                  | 74.5                                  | 72.3                                  |
| 800.0                                  | 78.2                                  | 78.8                                  | 78.3                                  | 77.0                                  | 75.8                                  | 74.3                                  |
| 1000.0                                 | 75.0                                  | 76.7                                  | 77.8                                  | 76.9                                  | 76.4                                  | 74.9                                  |
| 1250.0                                 | 73.0                                  | 75.9                                  | 77.2                                  | 76.5                                  | 75.8                                  | 74.1                                  |
| 1600.0                                 | 69.7                                  | 72.9                                  | 75.0                                  | 75.0                                  | 75.0                                  | 73.7                                  |
| 2000.0                                 | 67.7                                  | 70.8                                  | 73.3                                  | 74.1                                  | 74.2                                  | 73.2                                  |
| 2500.0                                 | 65.6                                  | 68.5                                  | 70.8                                  | 72.2                                  | 73.0                                  | 72.5                                  |
| 3150.0                                 | 62.6                                  | 66.4                                  | 69.0                                  | 70.8                                  | 72.0                                  | 72.1                                  |
| 4000.0                                 | 62.6                                  | 65.3                                  | 67.4                                  | 68.9                                  | 71.1                                  | 70.9                                  |
| 5000.0                                 | 62.0                                  | 64.1                                  | 65.5                                  | 66.9                                  | 69.6                                  | 70.1                                  |
| 6300.0                                 | 59.5                                  | 62.0                                  | 63.5                                  | 65.0                                  | 68.2                                  | 68.9                                  |
| 8000.0                                 | 58.9                                  | 60.6                                  | 62.4                                  | 63.5                                  | 66.7                                  | 67.9                                  |
| 10000.0                                | 57.3                                  | 58.3                                  | 60.1                                  | 61.1                                  | 65.6                                  | 67.0                                  |
| 12500.0                                | 55.3                                  | 58.2                                  | 60.2                                  | 61.0                                  | 64.8                                  | 66.2                                  |
| 16000.0                                | 52.6                                  | 57.4                                  | 59.1                                  | 59.9                                  | 63.7                                  | 65.5                                  |
| 20000.0                                | 51.0                                  | 56.1                                  | 57.7                                  | 58.3                                  | 62.4                                  | 64.5                                  |
| 25000.0                                | 50.5                                  | 56.0                                  | 56.7                                  | 57.3                                  | 61.3                                  | 63.8                                  |
| 31500.0                                | 50.7                                  | 56.1                                  | 54.8                                  | 55.3                                  | 59.5                                  | 62.0                                  |
| 40000.0                                | 52.5                                  | 57.8                                  | 53.8                                  | 54.3                                  | 58.5                                  | 60.8                                  |
| OVERALL<br>SPL                         | 84.9                                  | 85.8                                  | 86.5                                  | 85.7                                  | 85.2                                  | 84.2                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 59.7                                  | 58.8                                  | 57.6                                  | 57.2                                   | 59.2                                   | 59.8                                   |
| 250.0                                  | 62.1                                  | 60.3                                  | 59.5                                  | 58.3                                   | 60.3                                   | 59.9                                   |
| 315.2                                  | 65.0                                  | 63.9                                  | 62.0                                  | 61.9                                   | 61.9                                   | 62.0                                   |
| 400.0                                  | 68.2                                  | 66.1                                  | 64.6                                  | 63.1                                   | 64.1                                   | 62.5                                   |
| 500.0                                  | 70.1                                  | 68.3                                  | 66.6                                  | 65.4                                   | 65.8                                   | 65.4                                   |
| 630.0                                  | 71.6                                  | 69.9                                  | 67.9                                  | 67.3                                   | 67.4                                   | 66.4                                   |
| 800.0                                  | 73.0                                  | 71.0                                  | 69.9                                  | 69.3                                   | 69.0                                   | 68.2                                   |
| 1000.0                                 | 73.1                                  | 71.9                                  | 70.6                                  | 69.8                                   | 69.8                                   | 69.0                                   |
| 1250.0                                 | 73.3                                  | 72.2                                  | 70.8                                  | 69.9                                   | 70.5                                   | 68.7                                   |
| 1600.0                                 | 73.4                                  | 72.3                                  | 70.7                                  | 69.4                                   | 70.2                                   | 68.6                                   |
| 2000.0                                 | 72.8                                  | 72.0                                  | 70.6                                  | 69.7                                   | 70.1                                   | 68.7                                   |
| 2500.0                                 | 72.5                                  | 71.7                                  | 70.0                                  | 69.1                                   | 69.6                                   | 68.3                                   |
| 3150.0                                 | 72.2                                  | 71.3                                  | 69.6                                  | 69.0                                   | 69.7                                   | 68.3                                   |
| 4000.0                                 | 71.4                                  | 70.7                                  | 69.1                                  | 68.6                                   | 69.0                                   | 68.0                                   |
| 5000.0                                 | 70.9                                  | 70.1                                  | 68.4                                  | 68.0                                   | 68.8                                   | 67.9                                   |
| 6300.0                                 | 70.1                                  | 69.5                                  | 67.5                                  | 67.3                                   | 68.2                                   | 67.6                                   |
| 8000.0                                 | 69.4                                  | 68.8                                  | 67.2                                  | 66.8                                   | 68.0                                   | 67.4                                   |
| 10000.0                                | 68.7                                  | 68.1                                  | 66.6                                  | 66.6                                   | 67.4                                   | 67.5                                   |
| 12500.0                                | 68.1                                  | 67.5                                  | 66.2                                  | 66.2                                   | 67.3                                   | 67.4                                   |
| 16000.0                                | 67.6                                  | 67.0                                  | 66.1                                  | 65.7                                   | 67.2                                   | 67.1                                   |
| 20000.0                                | 66.8                                  | 65.8                                  | 65.2                                  | 64.5                                   | 66.3                                   | 66.2                                   |
| 25000.0                                | 66.1                                  | 64.9                                  | 64.8                                  | 63.7                                   | 65.6                                   | 65.4                                   |
| 31500.0                                | 64.4                                  | 63.3                                  | 63.2                                  | 61.6                                   | 64.3                                   | 63.5                                   |
| 40000.0                                | 63.0                                  | 62.2                                  | 61.8                                  | 59.9                                   | 64.5                                   | 61.8                                   |
| OVERALL<br>SPL                         | 84.0                                  | 82.9                                  | 81.5                                  | 80.8                                   | 81.5                                   | 80.6                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.85 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1050.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 225

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.060  
TEMPERATURE RATIO TR = 2.904  
MACH NUMBER MJ = 0.295  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.861  
JET DENSITY RATIO DJ/D0 = 0.350  
JET VELOCITY RATIO VJ/A0 = 0.500  
JET VELOCITY VJ = 558.3 FPS

TR/TJ = 1.015  
DR/D0 = 0.365  
DR/DJ = 1.044  
MASS FLOW = 0.320 POUNDS PER SECOND  
THRUST = 5.62 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 57.8                        | 60.0                        | 61.5                        | 61.5                        | 61.0                        | 60.1                        |
| 250.0                                  | 61.8                        | 61.7                        | 61.6                        | 60.9                        | 61.8                        | 62.1                        |
| 315.2                                  | 64.5                        | 64.4                        | 64.7                        | 64.6                        | 64.9                        | 64.6                        |
| 400.0                                  | 66.3                        | 65.8                        | 66.3                        | 65.2                        | 66.4                        | 65.9                        |
| 500.0                                  | 67.6                        | 67.5                        | 67.9                        | 67.5                        | 67.0                        | 66.7                        |
| 630.0                                  | 69.7                        | 69.3                        | 69.8                        | 68.4                        | 68.0                        | 67.9                        |
| 800.0                                  | 71.0                        | 70.6                        | 70.0                        | 69.4                        | 68.4                        | 68.4                        |
| 1000.0                                 | 71.7                        | 70.6                        | 69.8                        | 69.3                        | 68.5                        | 68.6                        |
| 1250.0                                 | 72.1                        | 70.6                        | 70.7                        | 70.1                        | 69.2                        | 68.6                        |
| 1600.0                                 | 71.3                        | 70.8                        | 70.6                        | 69.7                        | 69.0                        | 68.5                        |
| 2000.0                                 | 71.1                        | 71.1                        | 70.4                        | 69.9                        | 69.1                        | 68.5                        |
| 2500.0                                 | 70.3                        | 70.4                        | 69.8                        | 69.2                        | 68.8                        | 68.4                        |
| 3150.0                                 | 70.2                        | 69.6                        | 69.5                        | 69.3                        | 68.8                        | 68.3                        |
| 4000.0                                 | 69.3                        | 69.4                        | 69.4                        | 68.6                        | 68.4                        | 67.7                        |
| 5000.0                                 | 68.5                        | 68.8                        | 68.6                        | 68.3                        | 68.3                        | 67.3                        |
| 6300.0                                 | 67.8                        | 68.7                        | 68.3                        | 68.2                        | 68.1                        | 67.6                        |
| 8000.0                                 | 67.6                        | 68.5                        | 67.0                        | 67.6                        | 67.4                        | 66.6                        |
| 10000.0                                | 67.8                        | 68.2                        | 66.9                        | 67.0                        | 66.9                        | 66.3                        |
| 12500.0                                | 68.0                        | 67.0                        | 66.9                        | 66.8                        | 66.4                        | 65.9                        |
| 16000.0                                | 67.0                        | 66.9                        | 66.0                        | 66.1                        | 65.9                        | 65.3                        |
| 20000.0                                | 65.7                        | 67.1                        | 66.2                        | 66.1                        | 65.5                        | 65.1                        |
| 25000.0                                | 66.2                        | 65.9                        | 65.7                        | 65.9                        | 65.2                        | 64.9                        |
| 31500.0                                | 66.8                        | 66.4                        | 65.8                        | 66.0                        | 65.0                        | 65.0                        |
| 40000.0                                | 65.9                        | 66.5                        | 66.0                        | 66.5                        | 64.6                        | 65.5                        |
| OVERALL<br>SPL                         | 82.5                        | 82.2                        | 81.9                        | 81.5                        | 81.0                        | 80.6                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 59.2                                    | 59.7                                    | 61.6                                    | 61.7                                    |
| 250.0                                  | 62.5                                    | 61.4                                    | 61.6                                    | 61.8                                    |
| 315.2                                  | 64.0                                    | 63.6                                    | 62.6                                    | 62.7                                    |
| 400.0                                  | 65.0                                    | 64.6                                    | 64.6                                    | 64.4                                    |
| 500.0                                  | 66.3                                    | 65.3                                    | 65.4                                    | 64.6                                    |
| 630.0                                  | 67.6                                    | 66.6                                    | 66.6                                    | 65.5                                    |
| 800.0                                  | 68.1                                    | 67.2                                    | 66.4                                    | 65.6                                    |
| 1000.0                                 | 68.2                                    | 67.3                                    | 66.3                                    | 65.6                                    |
| 1250.0                                 | 68.3                                    | 67.1                                    | 66.4                                    | 64.4                                    |
| 1600.0                                 | 67.9                                    | 66.4                                    | 65.5                                    | 63.9                                    |
| 2000.0                                 | 68.3                                    | 67.0                                    | 65.9                                    | 63.3                                    |
| 2500.0                                 | 68.4                                    | 66.4                                    | 65.3                                    | 62.8                                    |
| 3150.0                                 | 68.0                                    | 66.5                                    | 65.0                                    | 62.3                                    |
| 4000.0                                 | 67.6                                    | 66.3                                    | 64.7                                    | 61.4                                    |
| 5000.0                                 | 67.1                                    | 65.7                                    | 63.8                                    | 60.5                                    |
| 6300.0                                 | 66.7                                    | 65.4                                    | 63.2                                    | 60.1                                    |
| 8000.0                                 | 66.0                                    | 64.4                                    | 62.1                                    | 58.7                                    |
| 10000.0                                | 65.4                                    | 63.3                                    | 60.7                                    | 57.1                                    |
| 12500.0                                | 64.7                                    | 62.6                                    | 59.7                                    | 55.8                                    |
| 16000.0                                | 64.3                                    | 61.7                                    | 59.0                                    | 54.2                                    |
| 20000.0                                | 63.7                                    | 60.6                                    | 58.0                                    | 52.9                                    |
| 25000.0                                | 63.0                                    | 59.6                                    | 56.7                                    | 50.4                                    |
| 31500.0                                | 62.6                                    | 58.7                                    | 55.9                                    | 49.1                                    |
| 40000.0                                | 62.5                                    | 58.3                                    | 54.8                                    | 49.2                                    |
| OVERALL<br>SPL                         | 80.0                                    | 78.6                                    | 77.5                                    | 75.8                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.24 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1190.00 DEG.F, CHAMBER TEMPERATURE = 106.00 DEG.F  
RELATIVE HUMIDITY = 27.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 61

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.087  
TEMPERATURE RATIO TR = 2.915  
MACH NUMBER MJ = 0.354  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.853  
JET DENSITY RATIO DJ/D0 = 0.350  
JET VELOCITY RATIO VJ/A0 = 0.599  
JET VELOCITY VJ = 698.3 FPS

TR/TJ = 1.022  
DR/D0 = 0.373  
DR/DJ = 1.064  
MASS FLOW = 0.384 POUNDS PER SECOND  
THRUST = 8.10 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 69.9                                  | 70.0                                  | 67.3                                  | 65.5                                  | 65.5                                  | 63.3                                  |
| 250.0                                  | 71.8                                  | 73.6                                  | 71.7                                  | 69.9                                  | 68.8                                  | 66.3                                  |
| 315.2                                  | 76.3                                  | 75.9                                  | 75.8                                  | 73.3                                  | 73.0                                  | 69.5                                  |
| 400.0                                  | 78.6                                  | 79.8                                  | 77.1                                  | 76.8                                  | 75.0                                  | 73.0                                  |
| 500.0                                  | 81.0                                  | 80.8                                  | 79.7                                  | 78.0                                  | 77.4                                  | 75.0                                  |
| 630.0                                  | 80.2                                  | 81.8                                  | 81.9                                  | 79.9                                  | 79.5                                  | 76.8                                  |
| 800.0                                  | 82.3                                  | 83.7                                  | 83.1                                  | 81.2                                  | 80.8                                  | 78.8                                  |
| 1000.0                                 | 79.9                                  | 82.2                                  | 82.8                                  | 81.7                                  | 81.6                                  | 79.9                                  |
| 1250.0                                 | 78.0                                  | 81.5                                  | 82.3                                  | 81.8                                  | 81.8                                  | 80.3                                  |
| 1600.0                                 | 74.9                                  | 78.8                                  | 80.3                                  | 80.2                                  | 81.3                                  | 80.2                                  |
| 2000.0                                 | 72.2                                  | 76.8                                  | 78.7                                  | 79.2                                  | 80.6                                  | 79.8                                  |
| 2500.0                                 | 69.6                                  | 74.5                                  | 76.2                                  | 77.6                                  | 79.4                                  | 79.2                                  |
| 3150.0                                 | 67.0                                  | 72.3                                  | 74.3                                  | 76.2                                  | 77.8                                  | 78.6                                  |
| 4000.0                                 | 66.2                                  | 71.1                                  | 72.7                                  | 74.6                                  | 76.8                                  | 77.5                                  |
| 5000.0                                 | 65.2                                  | 69.9                                  | 70.5                                  | 72.5                                  | 75.1                                  | 76.5                                  |
| 6300.0                                 | 63.3                                  | 68.0                                  | 68.3                                  | 70.6                                  | 73.4                                  | 75.2                                  |
| 8000.0                                 | 63.2                                  | 66.8                                  | 66.8                                  | 69.3                                  | 71.9                                  | 73.8                                  |
| 10000.0                                | 62.0                                  | 64.7                                  | 65.1                                  | 67.6                                  | 70.6                                  | 72.8                                  |
| 12500.0                                | 62.0                                  | 64.4                                  | 63.3                                  | 66.4                                  | 69.5                                  | 71.7                                  |
| 16000.0                                | 60.5                                  | 63.4                                  | 61.7                                  | 65.2                                  | 68.5                                  | 70.9                                  |
| 20000.0                                | 58.8                                  | 61.8                                  | 59.7                                  | 63.7                                  | 67.0                                  | 69.7                                  |
| 25000.0                                | 59.0                                  | 61.2                                  | 57.9                                  | 62.4                                  | 65.9                                  | 68.9                                  |
| 31500.0                                | 59.9                                  | 60.7                                  | 55.1                                  | 60.3                                  | 64.1                                  | 67.2                                  |
| 40000.0                                | 63.1                                  | 61.7                                  | 53.4                                  | 58.7                                  | 62.8                                  | 66.2                                  |
| OVERALL<br>SPL                         | 88.9                                  | 90.8                                  | 90.9                                  | 90.2                                  | 90.7                                  | 89.9                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 61.9                | 61.0                | 61.0                | 60.3                 | 60.8                 | 61.8                 |
| 250.0                   | 64.0                | 63.7                | 62.1                | 62.2                 | 61.8                 | 62.5                 |
| 315.2                   | 66.7                | 65.5                | 65.2                | 64.3                 | 63.7                 | 64.6                 |
| 400.0                   | 70.1                | 68.3                | 66.9                | 66.0                 | 66.0                 | 65.0                 |
| 500.0                   | 72.2                | 70.4                | 69.7                | 68.6                 | 68.1                 | 67.7                 |
| 630.0                   | 74.3                | 72.5                | 71.5                | 70.6                 | 70.2                 | 69.9                 |
| 800.0                   | 76.2                | 74.3                | 73.9                | 72.4                 | 71.7                 | 71.3                 |
| 1000.0                  | 77.4                | 75.2                | 74.7                | 73.4                 | 72.4                 | 72.1                 |
| 1250.0                  | 77.8                | 76.5                | 75.5                | 74.2                 | 73.8                 | 73.5                 |
| 1600.0                  | 78.2                | 76.5                | 75.6                | 74.3                 | 73.8                 | 73.4                 |
| 2000.0                  | 78.1                | 76.6                | 75.8                | 74.8                 | 74.1                 | 73.7                 |
| 2500.0                  | 77.5                | 76.3                | 75.4                | 74.3                 | 74.0                 | 73.6                 |
| 3150.0                  | 77.3                | 76.3                | 75.4                | 74.4                 | 74.1                 | 73.7                 |
| 4000.0                  | 76.6                | 76.0                | 75.1                | 73.8                 | 73.8                 | 73.1                 |
| 5000.0                  | 76.2                | 75.5                | 74.4                | 73.3                 | 73.4                 | 72.9                 |
| 6300.0                  | 75.2                | 74.8                | 73.4                | 72.8                 | 72.6                 | 72.4                 |
| 8000.0                  | 74.3                | 74.1                | 72.9                | 72.1                 | 72.3                 | 72.0                 |
| 10000.0                 | 73.6                | 73.3                | 72.0                | 71.6                 | 71.9                 | 71.6                 |
| 12500.0                 | 72.8                | 72.6                | 71.6                | 71.3                 | 71.1                 | 71.2                 |
| 16000.0                 | 71.9                | 72.1                | 71.4                | 70.8                 | 71.0                 | 70.9                 |
| 20000.0                 | 71.0                | 71.0                | 70.7                | 69.8                 | 69.8                 | 69.6                 |
| 25000.0                 | 70.4                | 70.0                | 70.2                | 69.0                 | 69.0                 | 68.6                 |
| 31500.0                 | 68.9                | 68.1                | 68.7                | 66.9                 | 67.6                 | 66.3                 |
| 40000.0                 | 68.3                | 66.9                | 67.4                | 65.0                 | 66.6                 | 64.5                 |
| OVERALL<br>SPL          | 88.5                | 87.4                | 86.5                | 85.5                 | 85.2                 | 84.8                 |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.23 PSI, ATMOSPHERIC PRESSURE = 14.16 PSI  
RESERVOIR TEMPERATURE = 1070.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 226

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.087  
TEMPERATURE RATIO TR = 2.942  
MACH NUMBER MJ = 0.354  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.880  
JET DENSITY RATIO DJ/D0 = 0.347  
JET VELOCITY RATIO VJ/A0 = 0.600  
JET VELOCITY VJ = 670.8 FPS

TR/TJ = 1.022  
DR/D0 = 0.369  
DR/DJ = 1.064  
MASS FLOW = 0.381 POUNDS PER SECOND  
THRUST = 8.06 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 58.3                        | 61.8                        | 62.4                        | 61.2                        | 62.2                        | 59.8                        |
| 250.0                                  | 62.8                        | 63.0                        | 62.5                        | 63.2                        | 63.0                        | 62.6                        |
| 315.2                                  | 65.4                        | 65.3                        | 65.8                        | 66.3                        | 66.3                        | 65.5                        |
| 400.0                                  | 67.5                        | 67.8                        | 67.5                        | 67.4                        | 67.1                        | 67.2                        |
| 500.0                                  | 69.6                        | 68.9                        | 69.4                        | 69.0                        | 69.7                        | 68.4                        |
| 630.0                                  | 72.0                        | 71.3                        | 71.2                        | 70.3                        | 70.8                        | 70.1                        |
| 800.0                                  | 73.4                        | 73.2                        | 71.8                        | 71.2                        | 71.6                        | 70.5                        |
| 1000.0                                 | 74.2                        | 73.0                        | 72.4                        | 72.5                        | 71.5                        | 70.2                        |
| 1250.0                                 | 74.4                        | 73.6                        | 73.5                        | 72.9                        | 72.6                        | 71.5                        |
| 1600.0                                 | 74.4                        | 74.3                        | 73.1                        | 73.4                        | 73.2                        | 71.7                        |
| 2000.0                                 | 74.0                        | 74.5                        | 73.9                        | 73.0                        | 72.6                        | 71.7                        |
| 2500.0                                 | 73.7                        | 73.5                        | 73.1                        | 72.6                        | 72.6                        | 71.3                        |
| 3150.0                                 | 73.5                        | 73.3                        | 73.1                        | 72.7                        | 72.2                        | 71.3                        |
| 4000.0                                 | 72.8                        | 72.9                        | 72.5                        | 72.1                        | 72.0                        | 70.8                        |
| 5000.0                                 | 72.0                        | 72.3                        | 72.5                        | 72.0                        | 72.1                        | 70.4                        |
| 6300.0                                 | 71.6                        | 72.5                        | 71.8                        | 71.5                        | 71.8                        | 70.1                        |
| 8000.0                                 | 71.0                        | 72.3                        | 70.5                        | 70.6                        | 70.9                        | 69.6                        |
| 10000.0                                | 71.4                        | 71.8                        | 70.1                        | 70.1                        | 70.5                        | 69.2                        |
| 12500.0                                | 71.4                        | 70.5                        | 70.2                        | 70.1                        | 70.2                        | 69.0                        |
| 16000.0                                | 70.3                        | 70.4                        | 69.2                        | 69.3                        | 69.7                        | 68.3                        |
| 20000.0                                | 69.2                        | 70.5                        | 69.5                        | 69.1                        | 69.0                        | 68.0                        |
| 25000.0                                | 69.4                        | 69.1                        | 69.0                        | 68.5                        | 68.5                        | 67.6                        |
| 31500.0                                | 70.0                        | 69.6                        | 68.9                        | 68.3                        | 68.3                        | 67.9                        |
| 40000.0                                | 69.6                        | 70.0                        | 69.3                        | 68.6                        | 67.8                        | 68.6                        |
| OVERALL<br>SPL                         | 85.4                        | 85.4                        | 84.8                        | 84.4                        | 84.4                        | 83.3                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 59.6                                    | 61.4                                    | 62.5                                    | 62.9                                    |
| 250.0                                  | 64.3                                    | 63.8                                    | 63.8                                    | 64.1                                    |
| 315.2                                  | 65.8                                    | 65.1                                    | 65.7                                    | 65.6                                    |
| 400.0                                  | 66.2                                    | 67.0                                    | 67.2                                    | 67.4                                    |
| 500.0                                  | 67.5                                    | 67.5                                    | 67.8                                    | 67.7                                    |
| 630.0                                  | 69.9                                    | 69.7                                    | 68.7                                    | 68.0                                    |
| 800.0                                  | 70.8                                    | 70.6                                    | 69.2                                    | 68.7                                    |
| 1000.0                                 | 70.7                                    | 70.2                                    | 69.7                                    | 68.7                                    |
| 1250.0                                 | 71.2                                    | 71.2                                    | 69.8                                    | 68.6                                    |
| 1600.0                                 | 70.6                                    | 70.5                                    | 69.2                                    | 68.1                                    |
| 2000.0                                 | 71.4                                    | 70.8                                    | 69.6                                    | 67.6                                    |
| 2500.0                                 | 71.5                                    | 70.7                                    | 68.8                                    | 67.0                                    |
| 3150.0                                 | 70.8                                    | 70.7                                    | 69.0                                    | 66.6                                    |
| 4000.0                                 | 70.5                                    | 70.7                                    | 68.8                                    | 66.2                                    |
| 5000.0                                 | 70.2                                    | 69.8                                    | 68.1                                    | 65.3                                    |
| 6300.0                                 | 70.0                                    | 69.3                                    | 67.5                                    | 64.8                                    |
| 8000.0                                 | 69.0                                    | 68.2                                    | 66.3                                    | 63.6                                    |
| 10000.0                                | 68.6                                    | 67.3                                    | 64.9                                    | 62.5                                    |
| 12500.0                                | 68.0                                    | 66.5                                    | 64.1                                    | 61.3                                    |
| 16000.0                                | 67.4                                    | 65.7                                    | 63.0                                    | 59.9                                    |
| 20000.0                                | 67.3                                    | 64.6                                    | 61.7                                    | 58.4                                    |
| 25000.0                                | 65.9                                    | 63.6                                    | 60.9                                    | 56.7                                    |
| 31500.0                                | 65.4                                    | 62.9                                    | 60.0                                    | 55.5                                    |
| 40000.0                                | 65.3                                    | 62.8                                    | 59.1                                    | 54.6                                    |
| OVERALL<br>SPL                         | 82.8                                    | 82.2                                    | 80.9                                    | 79.5                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.71 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1200.00 DEG.F, CHAMBER TEMPERATURE = 106.00 DEG.F  
RELATIVE HUMIDITY = 28.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 62

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.120  
TEMPERATURE RATIO TR = 2.933  
MACH NUMBER MJ = 0.414  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.849  
JET DENSITY RATIO DJ/D0 = 0.351  
JET VELOCITY RATIO VJ/A0 = 0.699  
JET VELOCITY VJ = 814.7 FPS

TR/TJ = 1.030  
DR/D0 = 0.382  
DR/DJ = 1.088  
MASS FLOW = 0.449 POUNDS PER SECOND  
THRUST = 11.04 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL.

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 74.8                                  | 73.8                                  | 71.4                                  | 68.7                                  | 69.0                                  | 66.6                                  |
| 250.0                                  | 77.1                                  | 76.8                                  | 76.1                                  | 73.5                                  | 71.8                                  | 69.4                                  |
| 315.2                                  | 81.7                                  | 80.1                                  | 79.8                                  | 76.8                                  | 75.0                                  | 72.6                                  |
| 400.0                                  | 83.9                                  | 84.1                                  | 81.3                                  | 79.6                                  | 77.8                                  | 76.0                                  |
| 500.0                                  | 87.4                                  | 85.0                                  | 84.2                                  | 82.0                                  | 80.4                                  | 77.7                                  |
| 630.0                                  | 85.6                                  | 86.6                                  | 86.7                                  | 83.8                                  | 82.4                                  | 79.6                                  |
| 800.0                                  | 88.9                                  | 89.6                                  | 88.5                                  | 86.5                                  | 84.4                                  | 81.4                                  |
| 1000.0                                 | 86.7                                  | 88.8                                  | 88.9                                  | 87.3                                  | 85.8                                  | 83.0                                  |
| 1250.0                                 | 85.4                                  | 88.4                                  | 88.5                                  | 87.2                                  | 86.2                                  | 83.4                                  |
| 1600.0                                 | 81.3                                  | 85.2                                  | 86.2                                  | 86.1                                  | 85.8                                  | 83.5                                  |
| 2000.0                                 | 78.5                                  | 83.2                                  | 84.4                                  | 85.1                                  | 85.4                                  | 83.6                                  |
| 2500.0                                 | 75.5                                  | 80.5                                  | 81.7                                  | 83.3                                  | 84.4                                  | 83.3                                  |
| 3150.0                                 | 72.7                                  | 78.3                                  | 79.7                                  | 81.7                                  | 83.4                                  | 83.0                                  |
| 4000.0                                 | 71.1                                  | 76.5                                  | 77.9                                  | 80.2                                  | 82.5                                  | 81.9                                  |
| 5000.0                                 | 70.0                                  | 74.6                                  | 76.0                                  | 78.1                                  | 81.1                                  | 81.2                                  |
| 6300.0                                 | 68.4                                  | 72.5                                  | 73.8                                  | 76.3                                  | 79.6                                  | 80.0                                  |
| 8000.0                                 | 68.2                                  | 70.8                                  | 72.5                                  | 74.6                                  | 78.2                                  | 78.9                                  |
| 10000.0                                | 63.0                                  | 68.7                                  | 70.8                                  | 73.0                                  | 76.7                                  | 77.5                                  |
| 12500.0                                | 66.8                                  | 67.8                                  | 69.3                                  | 71.5                                  | 75.5                                  | 76.5                                  |
| 16000.0                                | 64.7                                  | 67.1                                  | 67.7                                  | 70.3                                  | 74.2                                  | 75.5                                  |
| 20000.0                                | 61.0                                  | 65.3                                  | 65.9                                  | 68.7                                  | 72.6                                  | 74.1                                  |
| 25000.0                                | 59.3                                  | 64.7                                  | 65.0                                  | 67.4                                  | 71.5                                  | 73.4                                  |
| 31500.0                                | 58.3                                  | 64.1                                  | 62.7                                  | 65.0                                  | 70.0                                  | 71.8                                  |
| 40000.0                                | 58.7                                  | 65.3                                  | 60.8                                  | 63.4                                  | 69.1                                  | 71.6                                  |
| OVERALL<br>SPL                         | 95.2                                  | 96.5                                  | 96.4                                  | 95.4                                  | 95.2                                  | 93.7                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 64.6                                  | 63.5                                  | 63.7                                  | 63.4                                   | 62.9                                   | 63.8                                   |
| 250.0                                  | 67.0                                  | 66.2                                  | 64.2                                  | 64.7                                   | 64.7                                   | 64.4                                   |
| 315.2                                  | 70.3                                  | 68.7                                  | 67.3                                  | 67.4                                   | 66.7                                   | 67.5                                   |
| 400.0                                  | 72.5                                  | 71.5                                  | 69.7                                  | 69.0                                   | 68.8                                   | 67.7                                   |
| 500.0                                  | 74.8                                  | 73.6                                  | 72.3                                  | 71.4                                   | 70.6                                   | 70.4                                   |
| 630.0                                  | 76.7                                  | 75.8                                  | 74.4                                  | 73.7                                   | 73.2                                   | 72.8                                   |
| 800.0                                  | 78.9                                  | 78.3                                  | 76.3                                  | 75.5                                   | 74.9                                   | 74.5                                   |
| 1000.0                                 | 80.3                                  | 79.6                                  | 77.7                                  | 77.1                                   | 75.8                                   | 75.4                                   |
| 1250.0                                 | 80.9                                  | 80.5                                  | 79.2                                  | 78.4                                   | 77.4                                   | 76.9                                   |
| 1600.0                                 | 81.5                                  | 81.2                                  | 79.7                                  | 78.6                                   | 77.7                                   | 77.0                                   |
| 2000.0                                 | 81.9                                  | 81.4                                  | 80.2                                  | 79.3                                   | 78.3                                   | 77.3                                   |
| 2500.0                                 | 81.6                                  | 81.2                                  | 80.1                                  | 79.2                                   | 78.1                                   | 77.3                                   |
| 3150.0                                 | 81.5                                  | 81.4                                  | 80.1                                  | 79.4                                   | 78.5                                   | 77.7                                   |
| 4000.0                                 | 80.8                                  | 81.0                                  | 80.1                                  | 78.9                                   | 78.1                                   | 77.5                                   |
| 5000.0                                 | 80.7                                  | 80.6                                  | 79.5                                  | 78.4                                   | 77.7                                   | 77.4                                   |
| 6300.0                                 | 79.8                                  | 80.0                                  | 78.7                                  | 77.7                                   | 77.1                                   | 76.9                                   |
| 8000.0                                 | 79.3                                  | 79.2                                  | 78.0                                  | 77.0                                   | 76.7                                   | 76.6                                   |
| 10000.0                                | 78.5                                  | 78.4                                  | 77.1                                  | 75.9                                   | 76.2                                   | 76.2                                   |
| 12500.0                                | 77.9                                  | 77.7                                  | 76.8                                  | 75.6                                   | 75.3                                   | 75.9                                   |
| 16000.0                                | 77.0                                  | 77.2                                  | 76.5                                  | 74.8                                   | 75.0                                   | 75.4                                   |
| 20000.0                                | 75.9                                  | 75.9                                  | 75.3                                  | 73.6                                   | 73.8                                   | 74.1                                   |
| 25000.0                                | 75.4                                  | 75.0                                  | 74.8                                  | 72.7                                   | 73.0                                   | 73.0                                   |
| 31500.0                                | 74.1                                  | 73.4                                  | 73.4                                  | 70.8                                   | 71.2                                   | 71.1                                   |
| 40000.0                                | 73.8                                  | 72.6                                  | 72.2                                  | 69.1                                   | 70.2                                   | 69.5                                   |
| OVERALL<br>SPL                         | 92.4                                  | 92.1                                  | 90.9                                  | 89.8                                   | 89.2                                   | 88.8                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.70 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1078.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 227

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.120$   
TEMPERATURE RATIO  $TR = 2.958$   
MACH NUMBER  $MJ = 0.413$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.873$   
JET DENSITY RATIO  $DJ/D_0 = 0.348$   
JET VELOCITY RATIO  $VJ/A_0 = 0.701$   
JET VELOCITY  $VJ = 783.1$  FPS

$TR/TJ = 1.029$   
 $DR/D_0 = 0.379$   
 $DR/DJ = 1.088$   
MASS FLOW = 0.446 POUNDS PER SECOND  
THRUST = 11.01 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>Hz | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 62.0                                   | 64.3                                   | 64.5                                   | 64.1                                    | 65.7                                    | 62.5                                    |
| 250.0                                  | 65.6                                   | 64.5                                   | 65.8                                   | 64.7                                    | 66.3                                    | 65.9                                    |
| 315.2                                  | 67.4                                   | 67.2                                   | 68.6                                   | 68.5                                    | 69.0                                    | 68.7                                    |
| 400.0                                  | 69.8                                   | 69.3                                   | 70.7                                   | 70.1                                    | 70.3                                    | 69.2                                    |
| 500.0                                  | 72.9                                   | 72.0                                   | 72.7                                   | 72.4                                    | 71.3                                    | 70.9                                    |
| 630.0                                  | 75.3                                   | 74.6                                   | 74.5                                   | 74.4                                    | 74.0                                    | 73.1                                    |
| 800.0                                  | 77.1                                   | 76.5                                   | 75.6                                   | 74.6                                    | 75.1                                    | 74.5                                    |
| 1000.0                                 | 78.6                                   | 77.3                                   | 76.2                                   | 76.4                                    | 75.8                                    | 74.5                                    |
| 1250.0                                 | 79.7                                   | 78.3                                   | 77.6                                   | 77.3                                    | 77.0                                    | 75.9                                    |
| 1600.0                                 | 79.8                                   | 78.8                                   | 77.5                                   | 77.4                                    | 77.2                                    | 76.1                                    |
| 2000.0                                 | 79.7                                   | 79.4                                   | 78.2                                   | 78.3                                    | 77.5                                    | 76.4                                    |
| 2500.0                                 | 79.3                                   | 78.8                                   | 78.1                                   | 77.8                                    | 77.2                                    | 76.2                                    |
| 3150.0                                 | 79.2                                   | 78.6                                   | 77.6                                   | 77.8                                    | 77.3                                    | 76.2                                    |
| 4000.0                                 | 78.9                                   | 78.3                                   | 77.7                                   | 77.4                                    | 76.9                                    | 75.7                                    |
| 5000.0                                 | 78.4                                   | 78.0                                   | 77.6                                   | 76.7                                    | 76.6                                    | 75.5                                    |
| 6300.0                                 | 77.7                                   | 77.8                                   | 76.8                                   | 76.4                                    | 76.6                                    | 75.2                                    |
| 8000.0                                 | 77.2                                   | 77.7                                   | 75.6                                   | 75.6                                    | 75.4                                    | 74.5                                    |
| 10000.0                                | 77.0                                   | 77.3                                   | 75.3                                   | 75.0                                    | 75.0                                    | 74.3                                    |
| 12500.0                                | 77.0                                   | 75.7                                   | 74.9                                   | 74.7                                    | 74.5                                    | 73.5                                    |
| 16000.0                                | 75.3                                   | 75.2                                   | 73.5                                   | 74.4                                    | 74.2                                    | 73.1                                    |
| 20000.0                                | 73.3                                   | 75.3                                   | 73.9                                   | 73.8                                    | 73.7                                    | 72.6                                    |
| 25000.0                                | 74.4                                   | 74.0                                   | 73.4                                   | 73.4                                    | 73.4                                    | 72.4                                    |
| 31500.0                                | 74.6                                   | 74.4                                   | 73.5                                   | 73.6                                    | 73.4                                    | 72.5                                    |
| 40000.0                                | 74.2                                   | 74.6                                   | 73.7                                   | 74.3                                    | 73.1                                    | 73.3                                    |
| OVERALL<br>SPL                         | 90.6                                   | 90.1                                   | 89.2                                   | 89.0                                    | 88.7                                    | 87.7                                    |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 61.9                                    | 63.7                                    | 63.8                                    | 64.9                                    |
| 250.0                                  | 66.4                                    | 66.5                                    | 65.7                                    | 65.8                                    |
| 315.2                                  | 68.3                                    | 67.9                                    | 67.0                                    | 67.5                                    |
| 400.0                                  | 69.2                                    | 70.4                                    | 69.0                                    | 68.7                                    |
| 500.0                                  | 70.8                                    | 70.1                                    | 70.7                                    | 69.4                                    |
| 630.0                                  | 73.1                                    | 72.6                                    | 71.6                                    | 70.7                                    |
| 800.0                                  | 74.1                                    | 74.0                                    | 72.6                                    | 71.3                                    |
| 1000.0                                 | 74.4                                    | 74.2                                    | 73.8                                    | 72.2                                    |
| 1250.0                                 | 75.4                                    | 74.9                                    | 74.2                                    | 72.2                                    |
| 1600.0                                 | 75.6                                    | 74.6                                    | 73.5                                    | 72.1                                    |
| 2000.0                                 | 76.0                                    | 75.6                                    | 74.0                                    | 72.1                                    |
| 2500.0                                 | 75.9                                    | 75.2                                    | 73.9                                    | 71.6                                    |
| 3150.0                                 | 76.1                                    | 75.6                                    | 74.0                                    | 71.6                                    |
| 4000.0                                 | 75.7                                    | 75.7                                    | 73.7                                    | 70.9                                    |
| 5000.0                                 | 75.1                                    | 74.6                                    | 73.1                                    | 70.2                                    |
| 6300.0                                 | 74.8                                    | 74.2                                    | 72.7                                    | 70.0                                    |
| 8000.0                                 | 73.8                                    | 73.2                                    | 71.3                                    | 68.8                                    |
| 10000.0                                | 72.9                                    | 72.0                                    | 70.1                                    | 68.0                                    |
| 12500.0                                | 72.1                                    | 71.6                                    | 69.1                                    | 66.8                                    |
| 16000.0                                | 71.3                                    | 70.6                                    | 68.2                                    | 65.3                                    |
| 20000.0                                | 70.8                                    | 69.7                                    | 67.1                                    | 64.0                                    |
| 25000.0                                | 69.8                                    | 68.3                                    | 66.4                                    | 62.6                                    |
| 31500.0                                | 69.3                                    | 68.4                                    | 65.8                                    | 61.6                                    |
| 40000.0                                | 69.2                                    | 68.4                                    | 65.2                                    | 60.6                                    |
| OVERALL<br>SPL                         | 87.1                                    | 86.6                                    | 85.2                                    | 83.2                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.26 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1225.00 DEG.F, CHAMBER TEMPERATURE = 104.00 DEG.F  
RELATIVE HUMIDITY = 27.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 63

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.159  
TEMPERATURE RATIO TR = 2.988  
MACH NUMBER MJ = 0.473  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.877  
JET DENSITY RATIO  $\rho_J/\rho_0$  = 0.348  
JET VELOCITY RATIO  $V_J/A_0^*$  = 0.802  
JET VELOCITY VJ = 933.5 FPS

TR/TJ = 1.039  
DR/D0 = 0.388  
DR/DJ = 1.116  
MASS FLOW = 0.510 POUNDS PER SECOND  
THRUST = 14.41 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      |
|-------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| FREQ.<br>HZ             | NO. 1<br>ANGLE 15.0 | NO. 2<br>ANGLE 22.5 | NO. 3<br>ANGLE 30.0 | NO. 4<br>ANGLE 37.5 | NO. 5<br>ANGLE 45.0 | NO. 6<br>ANGLE 52.5 |
| 200.0                   | 77.2                | 76.4                | 74.2                | 72.0                | 70.7                | 68.9                |
| 250.0                   | 79.6                | 79.3                | 79.4                | 75.9                | 74.2                | 72.1                |
| 315.2                   | 84.1                | 82.3                | 83.1                | 79.2                | 77.2                | 74.3                |
| 400.0                   | 86.7                | 86.9                | 84.9                | 82.6                | 79.9                | 77.0                |
| 500.0                   | 89.8                | 88.1                | 87.4                | 85.5                | 82.2                | 79.2                |
| 630.0                   | 87.8                | 89.9                | 90.3                | 87.8                | 84.1                | 81.3                |
| 800.0                   | 91.5                | 92.8                | 92.0                | 90.1                | 86.2                | 83.6                |
| 1000.0                  | 89.9                | 92.2                | 93.6                | 91.5                | 87.9                | 85.5                |
| 1250.0                  | 89.7                | 92.8                | 94.0                | 92.0                | 89.0                | 86.3                |
| 1600.0                  | 86.7                | 90.2                | 91.9                | 90.5                | 88.9                | 86.8                |
| 2000.0                  | 83.2                | 87.6                | 90.2                | 89.8                | 88.8                | 86.6                |
| 2500.0                  | 79.7                | 84.5                | 87.2                | 87.6                | 87.8                | 86.2                |
| 3150.0                  | 76.5                | 82.0                | 85.3                | 86.0                | 86.9                | 86.2                |
| 4000.0                  | 75.3                | 80.2                | 83.7                | 84.6                | 86.0                | 85.5                |
| 5000.0                  | 73.6                | 78.3                | 81.3                | 82.5                | 85.0                | 84.8                |
| 6300.0                  | 71.7                | 76.1                | 79.5                | 80.7                | 83.7                | 83.6                |
| 8000.0                  | 70.6                | 74.4                | 77.7                | 79.4                | 82.5                | 82.6                |
| 10000.0                 | 72.7                | 72.4                | 75.4                | 77.6                | 81.3                | 81.8                |
| 12500.0                 | 69.0                | 71.0                | 74.4                | 76.2                | 79.9                | 80.4                |
| 16000.0                 | 67.1                | 70.2                | 73.2                | 74.8                | 78.7                | 79.5                |
| 20000.0                 | 63.5                | 67.9                | 71.7                | 73.2                | 77.1                | 78.1                |
| 25000.0                 | 61.7                | 67.0                | 70.7                | 72.1                | 76.2                | 77.5                |
| 31500.0                 | -8.7                | 65.9                | 68.5                | 70.0                | 74.4                | 76.0                |
| 40000.0                 | -7.6                | 66.6                | 66.6                | 68.4                | 73.7                | 75.7                |
| OVERALL<br>SPL          | 98.2                | 100.1               | 101.0               | 99.6                | 98.2                | 96.7                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 66.1                                  | 65.3                                  | 65.5                                  | 65.9                                   | 65.2                                   | 65.9                                   |
| 250.0                                  | 69.4                                  | 68.0                                  | 66.2                                  | 67.2                                   | 66.9                                   | 66.7                                   |
| 315.2                                  | 71.2                                  | 69.8                                  | 68.8                                  | 69.4                                   | 68.1                                   | 68.9                                   |
| 400.0                                  | 73.8                                  | 72.7                                  | 71.7                                  | 71.0                                   | 70.4                                   | 69.6                                   |
| 500.0                                  | 75.7                                  | 74.8                                  | 74.4                                  | 73.5                                   | 72.7                                   | 72.6                                   |
| 630.0                                  | 78.1                                  | 77.5                                  | 76.5                                  | 75.4                                   | 74.7                                   | 74.7                                   |
| 800.0                                  | 80.1                                  | 80.2                                  | 78.2                                  | 77.6                                   | 76.5                                   | 76.7                                   |
| 1000.0                                 | 81.6                                  | 81.9                                  | 80.4                                  | 79.3                                   | 78.2                                   | 78.1                                   |
| 1250.0                                 | 83.0                                  | 83.4                                  | 81.8                                  | 80.6                                   | 80.0                                   | 79.9                                   |
| 1600.0                                 | 83.6                                  | 83.7                                  | 82.5                                  | 81.3                                   | 80.2                                   | 80.1                                   |
| 2000.0                                 | 84.2                                  | 84.4                                  | 83.1                                  | 82.1                                   | 80.6                                   | 80.5                                   |
| 2500.0                                 | 84.1                                  | 84.4                                  | 83.5                                  | 82.0                                   | 81.0                                   | 80.8                                   |
| 3150.0                                 | 84.3                                  | 84.8                                  | 83.4                                  | 82.8                                   | 81.4                                   | 81.4                                   |
| 4000.0                                 | 84.2                                  | 84.6                                  | 83.4                                  | 82.5                                   | 81.1                                   | 81.0                                   |
| 5000.0                                 | 84.0                                  | 84.5                                  | 83.1                                  | 82.3                                   | 80.8                                   | 80.9                                   |
| 6300.0                                 | 83.5                                  | 83.7                                  | 82.3                                  | 81.8                                   | 80.4                                   | 80.6                                   |
| 8000.0                                 | 82.9                                  | 83.0                                  | 81.8                                  | 81.2                                   | 80.1                                   | 80.2                                   |
| 10000.0                                | 82.9                                  | 82.0                                  | 81.0                                  | 80.8                                   | 79.5                                   | 79.6                                   |
| 12500.0                                | 81.6                                  | 81.4                                  | 80.5                                  | 80.2                                   | 78.9                                   | 79.1                                   |
| 16000.0                                | 80.9                                  | 80.6                                  | 80.1                                  | 79.4                                   | 78.5                                   | 78.5                                   |
| 20000.0                                | 79.7                                  | 79.0                                  | 79.0                                  | 78.3                                   | 77.2                                   | 77.0                                   |
| 25000.0                                | 79.1                                  | 77.9                                  | 78.2                                  | 77.4                                   | 76.6                                   | 76.0                                   |
| 31500.0                                | 77.6                                  | 75.9                                  | 76.7                                  | 75.6                                   | 75.0                                   | 73.8                                   |
| 40000.0                                | 77.4                                  | 74.8                                  | 75.4                                  | 74.2                                   | 74.5                                   | 72.2                                   |
| OVERALL<br>SPL                         | 95.2                                  | 95.2                                  | 94.1                                  | 93.3                                   | 92.1                                   | 92.0                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.23 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1082.00 DEG.F, CHAMBER TEMPERATURE = 59.00 DEG.F  
RELATIVE HUMIDITY = 44.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 165

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 1.159$   
TEMPERATURE RATIO  $T_r = 2.971$   
MACH NUMBER  $M_J = 0.473$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 2.861$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.350$   
JET VELOCITY RATIO  $V_J/A_0 = 0.800$   
JET VELOCITY  $V_J = 893.3$  FPS

$T_r/T_J = 1.039$   
 $\rho_r/\rho_0 = 0.390$   
 $\rho_r/\rho_J = 1.116$   
MASS FLOW = 0.512 POUNDS PER SECOND  
THRUST = 14.42 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 65.0                                   | 66.3                                   | 66.6                                   | 66.3                                    | 66.1                                    | 64.1                                    |
| 250.0                                  | 67.0                                   | 67.6                                   | 66.8                                   | 66.8                                    | 68.0                                    | 68.2                                    |
| 315.2                                  | 69.3                                   | 70.0                                   | 70.0                                   | 70.1                                    | 70.3                                    | 70.8                                    |
| 400.0                                  | 71.9                                   | 72.1                                   | 71.6                                   | 71.8                                    | 72.0                                    | 71.8                                    |
| 500.0                                  | 75.2                                   | 74.4                                   | 74.3                                   | 74.3                                    | 73.9                                    | 73.6                                    |
| 630.0                                  | 77.7                                   | 76.7                                   | 76.2                                   | 75.7                                    | 75.7                                    | 75.5                                    |
| 800.0                                  | 79.8                                   | 78.8                                   | 77.6                                   | 76.9                                    | 76.9                                    | 76.7                                    |
| 1000.0                                 | 81.5                                   | 79.7                                   | 78.6                                   | 78.1                                    | 78.1                                    | 76.9                                    |
| 1250.0                                 | 82.6                                   | 80.7                                   | 80.4                                   | 79.7                                    | 79.4                                    | 78.3                                    |
| 1600.0                                 | 82.8                                   | 81.2                                   | 80.5                                   | 79.8                                    | 79.9                                    | 78.6                                    |
| 2000.0                                 | 83.1                                   | 81.9                                   | 81.0                                   | 80.1                                    | 80.1                                    | 79.1                                    |
| 2500.0                                 | 82.5                                   | 81.5                                   | 80.8                                   | 80.1                                    | 80.1                                    | 79.3                                    |
| 3150.0                                 | 83.0                                   | 81.7                                   | 81.1                                   | 80.2                                    | 80.1                                    | 79.2                                    |
| 4000.0                                 | 82.6                                   | 81.5                                   | 80.9                                   | 80.0                                    | 80.0                                    | 78.9                                    |
| 5000.0                                 | 81.8                                   | 81.1                                   | 80.8                                   | 79.5                                    | 79.7                                    | 78.5                                    |
| 6300.0                                 | 81.0                                   | 81.0                                   | 80.4                                   | 79.0                                    | 79.6                                    | 78.4                                    |
| 8000.0                                 | 80.6                                   | 81.1                                   | 79.0                                   | 78.5                                    | 78.7                                    | 77.5                                    |
| 10000.0                                | 80.6                                   | 80.7                                   | 78.3                                   | 77.9                                    | 78.0                                    | 76.8                                    |
| 12500.0                                | 80.2                                   | 79.1                                   | 78.4                                   | 77.5                                    | 77.7                                    | 76.3                                    |
| 16000.0                                | 78.9                                   | 78.4                                   | 76.9                                   | 76.8                                    | 77.1                                    | 75.7                                    |
| 20000.0                                | 76.9                                   | 78.8                                   | 77.0                                   | 76.1                                    | 76.4                                    | 75.0                                    |
| 25000.0                                | 77.0                                   | 78.0                                   | 76.9                                   | 75.8                                    | 76.2                                    | 75.0                                    |
| 31500.0                                | 76.9                                   | 78.1                                   | 76.5                                   | 75.3                                    | 75.7                                    | 74.7                                    |
| 40000.0                                | 75.8                                   | 78.1                                   | 76.3                                   | 75.4                                    | 75.0                                    | 75.0                                    |
| OVERALL<br>SPL                         | 93.8                                   | 93.1                                   | 92.1                                   | 91.3                                    | 91.4                                    | 90.4                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 63.6                        | 64.5                        | 64.9                        | 65.8                        |
| 250.0                                  | 68.3                        | 67.7                        | 67.2                        | 66.8                        |
| 315.2                                  | 70.4                        | 69.6                        | 67.7                        | 68.7                        |
| 400.0                                  | 71.6                        | 70.7                        | 70.4                        | 70.5                        |
| 500.0                                  | 72.7                        | 72.3                        | 71.6                        | 70.9                        |
| 630.0                                  | 75.8                        | 74.8                        | 72.5                        | 72.1                        |
| 800.0                                  | 76.4                        | 75.2                        | 74.1                        | 73.0                        |
| 1000.0                                 | 77.0                        | 75.8                        | 75.2                        | 74.1                        |
| 1250.0                                 | 78.1                        | 77.1                        | 75.8                        | 74.1                        |
| 1600.0                                 | 78.6                        | 77.1                        | 75.6                        | 74.2                        |
| 2000.0                                 | 79.2                        | 78.0                        | 76.4                        | 74.2                        |
| 2500.0                                 | 79.3                        | 78.1                        | 76.3                        | 74.0                        |
| 3150.0                                 | 79.1                        | 78.0                        | 76.4                        | 73.9                        |
| 4000.0                                 | 79.1                        | 77.6                        | 76.3                        | 73.4                        |
| 5000.0                                 | 78.8                        | 76.9                        | 75.7                        | 72.5                        |
| 6300.0                                 | 78.3                        | 76.5                        | 75.2                        | 72.1                        |
| 8000.0                                 | 77.6                        | 75.9                        | 74.3                        | 71.0                        |
| 10000.0                                | 76.9                        | 74.7                        | 73.2                        | 69.9                        |
| 12500.0                                | 76.1                        | 74.0                        | 72.0                        | 69.0                        |
| 16000.0                                | 75.3                        | 73.1                        | 71.3                        | 67.5                        |
| 20000.0                                | 74.5                        | 71.9                        | 69.9                        | 65.9                        |
| 25000.0                                | 74.0                        | 71.3                        | 69.5                        | 64.9                        |
| 31500.0                                | 73.3                        | 70.5                        | 68.6                        | 63.5                        |
| 40000.0                                | 72.8                        | 70.3                        | 67.6                        | 62.2                        |
| OVERALL<br>SPL                         | 90.3                        | 88.8                        | 87.3                        | 85.2                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.92 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1236.00 DEG.F, CHAMBER TEMPERATURE = 105.00 DEG.F  
RELATIVE HUMIDITY = 27.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 64

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.205$   
TEMPERATURE RATIO  $TR = 3.002$   
MACH NUMBER  $MJ = 0.533$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 2.861$   
JET DENSITY RATIO  $DJ/D0 = 0.349$   
JET VELOCITY RATIO  $VJ/A0 = 0.902$   
JET VELOCITY  $VJ = 1051.2$  FPS

$TR/TJ = 1.049$   
 $DR/D0 = 0.402$   
 $DR/DJ = 1.149$   
MASS FLOW = 0.577 POUNDS PER SECOND  
THRUST = 18.34 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 79.7  |       | 79.3  |       | 77.2  |       |
| 250.0   | 81.0  |       | 81.8  |       | 81.6  |       |
| 315.2   | 86.7  |       | 84.9  |       | 85.3  |       |
| 400.0   | 88.9  |       | 89.6  |       | 87.1  |       |
| 500.0   | 92.1  |       | 90.8  |       | 90.1  |       |
| 630.0   | 90.5  |       | 92.5  |       | 92.7  |       |
| 800.0   | 94.5  |       | 95.7  |       | 95.3  |       |
| 1000.0  | 93.2  |       | 95.5  |       | 97.1  |       |
| 1250.0  | 93.7  |       | 96.7  |       | 98.2  |       |
| 1600.0  | 92.4  |       | 94.8  |       | 96.6  |       |
| 2000.0  | 89.6  |       | 93.0  |       | 94.6  |       |
| 2500.0  | 85.4  |       | 89.6  |       | 91.5  |       |
| 3150.0  | 81.5  |       | 87.0  |       | 89.4  |       |
| 4000.0  | 79.1  |       | 84.9  |       | 87.4  |       |
| 5000.0  | 76.8  |       | 82.6  |       | 85.1  |       |
| 6300.0  | 74.3  |       | 80.5  |       | 82.9  |       |
| 8000.0  | 72.8  |       | 78.9  |       | 81.3  |       |
| 10000.0 | 70.7  |       | 76.8  |       | 79.6  |       |
| 12500.0 | 70.5  |       | 75.5  |       | 78.0  |       |
| 16000.0 | 68.8  |       | 74.5  |       | 76.5  |       |
| 20000.0 | 65.7  |       | 72.7  |       | 74.9  |       |
| 25000.0 | 74.2  |       | 71.4  |       | 73.6  |       |
| 31500.0 | 62.3  |       | 69.6  |       | 71.5  |       |
| 40000.0 | -7.6  |       | 69.1  |       | 69.4  |       |
|         |       |       |       |       | 71.4  |       |
|         |       |       |       |       | 74.5  |       |
|         |       |       |       |       | 78.4  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 101.7 |       | 103.7 |       | 104.8 |       |
|         |       |       |       |       | 103.6 |       |
|         |       |       |       |       | 103.5 |       |
|         |       |       |       |       | 102.2 |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 68.5                                  | 67.0                                  | 67.4                                  | 67.0                                   | 66.7                                   | 67.6                                   |
| 250.0                                  | 70.5                                  | 69.4                                  | 69.0                                  | 68.7                                   | 68.7                                   | 68.5                                   |
| 315.2                                  | 73.4                                  | 72.7                                  | 71.0                                  | 71.3                                   | 70.4                                   | 71.0                                   |
| 400.0                                  | 75.8                                  | 75.0                                  | 73.5                                  | 73.0                                   | 72.9                                   | 71.9                                   |
| 500.0                                  | 77.8                                  | 77.3                                  | 76.1                                  | 75.0                                   | 74.4                                   | 74.4                                   |
| 630.0                                  | 79.8                                  | 79.8                                  | 78.2                                  | 77.0                                   | 76.6                                   | 76.3                                   |
| 800.0                                  | 82.2                                  | 82.1                                  | 80.4                                  | 79.0                                   | 78.7                                   | 78.2                                   |
| 1000.0                                 | 84.0                                  | 83.8                                  | 82.7                                  | 81.2                                   | 80.2                                   | 79.9                                   |
| 1250.0                                 | 85.7                                  | 85.6                                  | 84.2                                  | 82.9                                   | 82.2                                   | 81.8                                   |
| 1600.0                                 | 86.3                                  | 86.4                                  | 84.7                                  | 83.7                                   | 82.8                                   | 82.4                                   |
| 2000.0                                 | 87.0                                  | 87.5                                  | 85.9                                  | 84.6                                   | 83.6                                   | 83.2                                   |
| 2500.0                                 | 86.9                                  | 87.7                                  | 86.0                                  | 85.0                                   | 83.6                                   | 83.2                                   |
| 3150.0                                 | 87.5                                  | 87.8                                  | 86.3                                  | 85.6                                   | 84.2                                   | 83.8                                   |
| 4000.0                                 | 87.3                                  | 87.9                                  | 86.6                                  | 85.5                                   | 84.0                                   | 83.7                                   |
| 5000.0                                 | 87.3                                  | 87.9                                  | 86.3                                  | 85.6                                   | 84.0                                   | 83.9                                   |
| 6300.0                                 | 86.6                                  | 87.2                                  | 85.5                                  | 85.2                                   | 83.8                                   | 83.5                                   |
| 8000.0                                 | 86.1                                  | 86.8                                  | 85.0                                  | 84.7                                   | 83.3                                   | 83.0                                   |
| 10000.0                                | 85.4                                  | 86.2                                  | 84.1                                  | 84.2                                   | 82.7                                   | 82.8                                   |
| 12500.0                                | 84.7                                  | 85.5                                  | 83.5                                  | 83.6                                   | 82.1                                   | 82.3                                   |
| 16000.0                                | 83.7                                  | 84.8                                  | 83.0                                  | 82.7                                   | 81.6                                   | 81.5                                   |
| 20000.0                                | 82.5                                  | 83.3                                  | 81.9                                  | 81.4                                   | 80.6                                   | 80.2                                   |
| 25000.0                                | 81.7                                  | 82.2                                  | 81.1                                  | 80.5                                   | 79.8                                   | 79.0                                   |
| 31500.0                                | 80.3                                  | 80.2                                  | 79.4                                  | 78.5                                   | 78.4                                   | 76.9                                   |
| 40000.0                                | 79.8                                  | 79.0                                  | 77.9                                  | 77.1                                   | 77.8                                   | 75.2                                   |
| OVERALL<br>SPL                         | 98.0                                  | 98.5                                  | 96.9                                  | 96.2                                   | 95.0                                   | 94.7                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.87 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1100.00 DEG.F, CHAMBER TEMPERATURE = 58.00 DEG.F  
RELATIVE HUMIDITY = 48.0 PERCENT  
GAMMA = 1.345

RUN NUMBER 166

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.205$   
TEMPERATURE RATIO  $TR = 3.012$   
MACH NUMBER  $MJ = 0.533$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.871$   
JET DENSITY RATIO  $DJ/D_0 = 0.348$   
JET VELOCITY RATIO  $VJ/A_0 = 0.902$   
JET VELOCITY  $VJ = 1006.8$  FPS

$TR/TJ = 1.049$   
 $DR/D_0 = 0.400$   
 $DR/DJ = 1.149$   
MASS FLOW = 0.575 POUNDS PER SECOND  
THRUST = 18.28 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 66.5                                   | 68.1                                   | 69.0                                   | 68.2                                    | 66.9                                    | 66.1                                    |
| 250.0                                  | 69.6                                   | 69.0                                   | 68.8                                   | 68.5                                    | 70.1                                    | 69.7                                    |
| 315.2                                  | 71.4                                   | 71.4                                   | 71.6                                   | 72.1                                    | 73.3                                    | 72.2                                    |
| 400.0                                  | 74.2                                   | 73.8                                   | 73.8                                   | 73.6                                    | 74.6                                    | 73.5                                    |
| 500.0                                  | 77.2                                   | 76.5                                   | 76.6                                   | 76.5                                    | 76.6                                    | 75.4                                    |
| 630.0                                  | 79.5                                   | 78.7                                   | 78.6                                   | 78.2                                    | 78.2                                    | 78.1                                    |
| 800.0                                  | 82.0                                   | 81.2                                   | 80.2                                   | 79.3                                    | 79.8                                    | 79.3                                    |
| 1000.0                                 | 83.7                                   | 81.9                                   | 81.0                                   | 80.8                                    | 80.1                                    | 79.6                                    |
| 1250.0                                 | 85.6                                   | 83.3                                   | 83.2                                   | 82.4                                    | 82.1                                    | 80.9                                    |
| 1600.0                                 | 85.9                                   | 84.1                                   | 83.4                                   | 82.6                                    | 82.6                                    | 81.5                                    |
| 2000.0                                 | 86.4                                   | 85.2                                   | 84.1                                   | 83.6                                    | 83.0                                    | 82.2                                    |
| 2500.0                                 | 86.0                                   | 85.0                                   | 84.1                                   | 83.7                                    | 83.4                                    | 82.4                                    |
| 3150.0                                 | 86.7                                   | 85.3                                   | 84.4                                   | 84.0                                    | 83.5                                    | 82.3                                    |
| 4000.0                                 | 86.4                                   | 85.1                                   | 84.5                                   | 83.9                                    | 83.5                                    | 82.1                                    |
| 5000.0                                 | 85.7                                   | 84.7                                   | 84.4                                   | 83.4                                    | 83.3                                    | 81.7                                    |
| 6300.0                                 | 85.3                                   | 85.0                                   | 84.0                                   | 83.1                                    | 83.2                                    | 81.7                                    |
| 8000.0                                 | 85.0                                   | 84.9                                   | 82.5                                   | 82.5                                    | 82.3                                    | 80.8                                    |
| 10000.0                                | 84.8                                   | 84.4                                   | 81.9                                   | 81.8                                    | 81.8                                    | 80.2                                    |
| 12500.0                                | 84.6                                   | 82.8                                   | 82.0                                   | 81.3                                    | 81.6                                    | 79.6                                    |
| 16000.0                                | 83.4                                   | 82.2                                   | 80.6                                   | 80.8                                    | 80.9                                    | 79.0                                    |
| 20000.0                                | 81.7                                   | 82.5                                   | 80.7                                   | 80.3                                    | 80.3                                    | 78.3                                    |
| 25000.0                                | 81.7                                   | 81.5                                   | 80.5                                   | 79.9                                    | 80.0                                    | 78.2                                    |
| 31500.0                                | 81.5                                   | 81.6                                   | 80.1                                   | 79.2                                    | 79.6                                    | 78.0                                    |
| 40000.0                                | 80.5                                   | 81.6                                   | 79.9                                   | 79.1                                    | 78.7                                    | 78.2                                    |
| OVERALL<br>SPL                         | 97.4                                   | 96.4                                   | 95.4                                   | 94.9                                    | 94.7                                    | 93.5                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 65.3                        | 65.9                        | 66.5                        | 68.1                        |
| 250.0                                  | 69.9                        | 69.5                        | 69.3                        | 69.2                        |
| 315.2                                  | 72.2                        | 71.6                        | 70.3                        | 70.4                        |
| 400.0                                  | 73.0                        | 72.3                        | 71.8                        | 72.2                        |
| 500.0                                  | 75.3                        | 74.4                        | 73.8                        | 73.3                        |
| 630.0                                  | 78.1                        | 76.7                        | 74.9                        | 73.7                        |
| 800.0                                  | 78.9                        | 77.5                        | 76.6                        | 74.8                        |
| 1000.0                                 | 79.4                        | 78.2                        | 77.5                        | 76.3                        |
| 1250.0                                 | 80.8                        | 79.8                        | 78.5                        | 76.8                        |
| 1600.0                                 | 81.0                        | 79.9                        | 78.7                        | 77.0                        |
| 2000.0                                 | 81.9                        | 81.0                        | 79.4                        | 77.3                        |
| 2500.0                                 | 82.1                        | 81.2                        | 79.2                        | 77.8                        |
| 3150.0                                 | 82.3                        | 81.3                        | 79.4                        | 77.6                        |
| 4000.0                                 | 82.3                        | 81.3                        | 79.5                        | 77.4                        |
| 5000.0                                 | 82.2                        | 80.7                        | 78.8                        | 76.6                        |
| 6300.0                                 | 81.8                        | 80.4                        | 78.6                        | 76.6                        |
| 8000.0                                 | 81.0                        | 80.0                        | 77.2                        | 75.7                        |
| 10000.0                                | 80.3                        | 78.8                        | 76.2                        | 74.5                        |
| 12500.0                                | 79.3                        | 78.0                        | 74.9                        | 73.6                        |
| 16000.0                                | 78.7                        | 77.1                        | 74.0                        | 72.2                        |
| 20000.0                                | 77.7                        | 75.9                        | 73.0                        | 70.8                        |
| 25000.0                                | 77.4                        | 75.4                        | 72.4                        | 69.7                        |
| 31500.0                                | 76.7                        | 74.7                        | 71.5                        | 68.4                        |
| 40000.0                                | 76.2                        | 74.4                        | 70.5                        | 67.2                        |
| OVERALL<br>SPL                         | 93.3                        | 92.1                        | 90.2                        | 88.5                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 5.05 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1290.00 DEG.F, CHAMBER TEMPERATURE = 103.00 DEG.F  
RELATIVE HUMIDITY = 24.0 PERCENT  
GAMMA = 1.340

RUN NUMBER 65

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.355$   
TEMPERATURE RATIO  $TR = 3.108$   
MACH NUMBER  $MJ = 0.667$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 2.878$   
JET DENSITY RATIO  $DJ/DO = 0.348$   
JET VELOCITY RATIO  $VJ/AO = 1.165$   
JET VELOCITY  $VJ = 1354.8$  FPS

$TR/TJ = 1.080$   
 $DR/DO = 0.436$   
 $DR/DJ = 1.255$   
MASS FLOW = 0.741 POUNDS PER SECOND  
THRUST = 30.39 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 83.8  |       | 84.2  |       | 80.1  | 78.1  |
| 250.0   | 87.0  |       | 87.9  |       | 86.1  | 83.4  |
| 315.2   | 92.2  |       | 90.0  |       | 90.1  | 86.8  |
| 400.0   | 94.4  |       | 94.8  |       | 92.5  | 89.9  |
| 500.0   | 98.1  |       | 96.4  |       | 95.6  | 93.0  |
| 630.0   | 96.2  |       | 98.3  |       | 98.9  | 96.0  |
| 800.0   | 100.1 |       | 101.6 |       | 101.2 | 98.9  |
| 1000.0  | 99.4  |       | 101.9 |       | 103.0 | 101.3 |
| 1250.0  | 100.6 |       | 103.2 |       | 105.0 | 103.5 |
| 1600.0  | 101.0 |       | 103.6 |       | 105.3 | 103.9 |
| 2000.0  | 101.1 |       | 103.9 |       | 105.5 | 104.2 |
| 2500.0  | 100.0 |       | 102.7 |       | 103.8 | 102.6 |
| 3150.0  | 97.6  |       | 100.1 |       | 101.4 | 100.5 |
| 4000.0  | 93.8  |       | 97.2  |       | 98.9  | 98.5  |
| 5000.0  | 90.0  |       | 94.2  |       | 96.3  | 96.3  |
| 6300.0  | 87.0  |       | 91.2  |       | 93.8  | 94.4  |
| 8000.0  | 84.6  |       | 89.3  |       | 92.0  | 92.7  |
| 10000.0 | 82.6  |       | 87.0  |       | 89.9  | 91.0  |
| 12500.0 | 80.9  |       | 85.3  |       | 88.0  | 89.4  |
| 16000.0 | 79.1  |       | 83.9  |       | 86.1  | 87.8  |
| 20000.0 | 75.9  |       | 81.6  |       | 83.9  | 85.7  |
| 25000.0 | 73.9  |       | 80.2  |       | 82.6  | 84.0  |
| 31500.0 | 71.5  |       | 78.3  |       | 80.1  | 81.1  |
| 40000.0 | 2.4   |       | 78.0  |       | 77.8  | 79.3  |
| OVERALL |       |       |       |       |       |       |
| ALL     | 109.6 |       | 111.9 |       | 113.1 | 111.8 |
|         |       |       |       |       | 111.5 | 109.4 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  |
|         | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
| 200.0   | 72.4  |       | 72.3  |       | 72.4  | 71.3  |
| 250.0   | 76.3  |       | 74.4  |       | 74.0  | 73.0  |
| 315.2   | 78.9  |       | 77.0  |       | 76.2  | 75.8  |
| 400.0   | 82.4  |       | 79.8  |       | 78.6  | 77.9  |
| 500.0   | 85.0  |       | 81.8  |       | 80.5  | 80.0  |
| 630.0   | 87.4  |       | 84.6  |       | 83.0  | 82.2  |
| 800.0   | 90.2  |       | 87.0  |       | 85.1  | 83.7  |
| 1000.0  | 92.3  |       | 89.6  |       | 88.0  | 86.2  |
| 1250.0  | 94.3  |       | 91.8  |       | 89.9  | 88.3  |
| 1600.0  | 95.9  |       | 93.0  |       | 91.0  | 89.5  |
| 2000.0  | 96.7  |       | 94.2  |       | 92.6  | 90.7  |
| 2500.0  | 97.0  |       | 94.8  |       | 93.1  | 91.4  |
| 3150.0  | 97.7  |       | 95.6  |       | 93.7  | 92.2  |
| 4000.0  | 97.7  |       | 95.8  |       | 94.5  | 92.4  |
| 5000.0  | 97.8  |       | 96.1  |       | 94.3  | 92.6  |
| 6300.0  | 97.0  |       | 95.8  |       | 93.9  | 92.4  |
| 8000.0  | 96.7  |       | 95.5  |       | 93.7  | 92.1  |
| 10000.0 | 95.8  |       | 95.1  |       | 92.9  | 91.6  |
| 12500.0 | 95.0  |       | 94.5  |       | 92.5  | 91.1  |
| 16000.0 | 93.9  |       | 93.8  |       | 91.9  | 90.4  |
| 20000.0 | 92.5  |       | 92.4  |       | 91.1  | 89.1  |
| 25000.0 | 91.3  |       | 91.3  |       | 90.6  | 88.1  |
| 31500.0 | 89.0  |       | 89.2  |       | 88.9  | 86.1  |
| 40000.0 | 87.2  |       | 88.0  |       | 87.4  | 84.4  |
|         |       |       |       |       |       |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 107.9 |       | 106.3 |       | 104.7 | 102.9 |
|         |       |       |       |       |       | 102.2 |
|         |       |       |       |       |       | 101.4 |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.98 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1148.00 DEG.F, CHAMBER TEMPERATURE = 59.00 DEG.F  
RELATIVE HUMIDITY = 49.0 PERCENT  
GAMMA = 1.340

RUN NUMBER 167

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.355$   
TEMPERATURE RATIO  $TR = 3.098$   
MACH NUMBER  $MJ = 0.687$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 2.868$   
JET DENSITY RATIO  $DJ/D_0 = 0.349$   
JET VELOCITY RATIO  $VJ/A_0 = 1.163$   
JET VELOCITY  $VJ = 1298.8$  FPS

$TR/TJ = 1.080$   
 $DR/D_0 = 0.437$   
 $DR/DJ = 1.255$   
MASS FLOW = 0.742 POUNDS PER SECOND  
THRUST = 30.40 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 69.5                                   | 71.7                                   | 75.7                                   | 71.4                                    | 70.7                                    | 69.0                                    |
| 250.0                                  | 72.4                                   | 72.8                                   | 75.4                                   | 71.6                                    | 72.4                                    | 72.2                                    |
| 315.2                                  | 74.1                                   | 74.4                                   | 76.2                                   | 75.0                                    | 75.7                                    | 75.8                                    |
| 400.0                                  | 77.5                                   | 77.8                                   | 78.3                                   | 77.4                                    | 77.6                                    | 77.0                                    |
| 500.0                                  | 80.1                                   | 79.3                                   | 79.8                                   | 80.1                                    | 79.6                                    | 78.8                                    |
| 630.0                                  | 82.7                                   | 82.1                                   | 82.2                                   | 82.1                                    | 82.1                                    | 82.4                                    |
| 800.0                                  | 85.6                                   | 85.0                                   | 83.9                                   | 83.5                                    | 83.5                                    | 83.5                                    |
| 1000.0                                 | 87.9                                   | 86.7                                   | 84.5                                   | 84.8                                    | 84.2                                    | 83.6                                    |
| 1250.0                                 | 89.6                                   | 87.9                                   | 86.5                                   | 86.5                                    | 85.9                                    | 85.2                                    |
| 1600.0                                 | 90.7                                   | 88.9                                   | 87.1                                   | 87.1                                    | 86.8                                    | 86.1                                    |
| 2000.0                                 | 91.4                                   | 90.5                                   | 87.9                                   | 88.0                                    | 87.3                                    | 87.2                                    |
| 2500.0                                 | 91.5                                   | 91.0                                   | 88.5                                   | 88.8                                    | 88.4                                    | 87.7                                    |
| 3150.0                                 | 92.0                                   | 91.1                                   | 88.8                                   | 89.4                                    | 88.6                                    | 88.0                                    |
| 4000.0                                 | 92.2                                   | 91.5                                   | 89.1                                   | 89.4                                    | 88.8                                    | 88.0                                    |
| 5000.0                                 | 91.8                                   | 91.3                                   | 88.9                                   | 89.1                                    | 88.6                                    | 87.9                                    |
| 6300.0                                 | 91.2                                   | 91.6                                   | 89.5                                   | 88.7                                    | 88.8                                    | 88.1                                    |
| 8000.0                                 | 91.4                                   | 92.0                                   | 87.1                                   | 88.5                                    | 88.1                                    | 87.1                                    |
| 10000.0                                | 91.2                                   | 91.1                                   | 86.8                                   | 87.5                                    | 87.6                                    | 86.2                                    |
| 12500.0                                | 90.9                                   | 89.8                                   | 85.4                                   | 87.2                                    | 87.1                                    | 85.5                                    |
| 16000.0                                | 89.4                                   | 89.0                                   | 83.0                                   | 86.5                                    | 86.6                                    | 84.6                                    |
| 20000.0                                | 87.4                                   | 89.2                                   | 81.9                                   | 85.7                                    | 85.7                                    | 83.7                                    |
| 25000.0                                | 87.2                                   | 87.9                                   | 80.0                                   | 85.1                                    | 85.3                                    | 83.2                                    |
| 31500.0                                | 86.9                                   | 88.1                                   | 78.3                                   | 84.6                                    | 85.1                                    | 83.0                                    |
| 40000.0                                | 85.6                                   | 87.9                                   | 76.4                                   | 84.4                                    | 84.2                                    | 83.1                                    |
| OVERALL<br>SPL                         | 102.8                                  | 102.5                                  | 99.2                                   | 100.0                                   | 99.7                                    | 98.8                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 7     | 35.3  |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 68.3  |       | 0.0   | 70.1  |
| 250.0   | 73.2  |       | 0.0   | 73.1  |
| 315.2   | 75.9  |       | 0.0   | 74.1  |
| 400.0   | 76.7  |       | 0.0   | 75.4  |
| 500.0   | 78.9  |       | 0.0   | 77.6  |
| 630.0   | 82.9  |       | 0.0   | 79.4  |
| 800.0   | 83.6  |       | 0.0   | 81.3  |
| 1000.0  | 84.1  |       | 0.0   | 82.5  |
| 1250.0  | 84.8  |       | 0.0   | 83.8  |
| 1600.0  | 86.0  |       | 0.0   | 84.4  |
| 2000.0  | 86.9  |       | 0.0   | 85.0  |
| 2500.0  | 87.6  |       | 0.0   | 85.6  |
| 3150.0  | 87.9  |       | 0.0   | 85.8  |
| 4000.0  | 88.3  |       | 0.0   | 86.2  |
| 5000.0  | 88.2  |       | 0.0   | 85.7  |
| 6300.0  | 88.1  |       | 0.0   | 85.5  |
| 8000.0  | 87.6  |       | 0.0   | 84.4  |
| 10000.0 | 86.9  |       | 0.0   | 83.3  |
| 12500.0 | 86.3  |       | 0.0   | 82.4  |
| 16000.0 | 85.5  |       | 0.0   | 81.5  |
| 20000.0 | 84.9  |       | 0.0   | 80.3  |
| 25000.0 | 84.1  |       | 0.0   | 79.5  |
| 31500.0 | 83.7  |       | 0.0   | 78.9  |
| 40000.0 | 83.3  |       | 0.0   | 78.0  |
| OVERALL |       |       |       |       |
| SPL     | 99.1  |       | 0.0   | 96.4  |
|         |       |       |       | 94.4  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 6.87 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1326.00 DEG.F, CHAMBER TEMPERATURE = 110.00 DEG.F  
RELATIVE HUMIDITY = 23.0 PERCENT  
GAMMA = 1.340

RUN NUMBER 66

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.483  
TEMPERATURE RATIO TR = 3.133  
MACH NUMBER MJ = 0.787  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.835  
JET DENSITY RATIO DJ/D0 = 0.353  
JET VELOCITY RATIO VJ/A0 = 1.324  
JET VELOCITY VJ = 1550.0 FPS

TR/TJ = 1.105  
DR/D0 = 0.473  
DR/DJ = 1.342  
MASS FLOW = 0.855 POUNDS PER SECOND  
THRUST = 39.88 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 87.9                                  | 88.2                                  | 84.1                                  | 80.2                                  | 80.1                                  | 77.4                                  |
| 250.0                                  | 90.1                                  | 91.0                                  | 89.0                                  | 85.4                                  | 83.8                                  | 80.1                                  |
| 315.2                                  | 94.9                                  | 93.0                                  | 92.8                                  | 89.7                                  | 87.1                                  | 84.2                                  |
| 400.0                                  | 97.6                                  | 97.5                                  | 95.4                                  | 92.6                                  | 91.3                                  | 87.8                                  |
| 500.0                                  | 100.7                                 | 99.0                                  | 97.8                                  | 96.3                                  | 93.9                                  | 90.2                                  |
| 630.0                                  | 99.6                                  | 100.9                                 | 101.6                                 | 98.9                                  | 97.3                                  | 93.2                                  |
| 800.0                                  | 103.0                                 | 104.9                                 | 104.0                                 | 102.0                                 | 100.1                                 | 96.2                                  |
| 1000.0                                 | 102.4                                 | 105.1                                 | 106.2                                 | 104.8                                 | 102.8                                 | 99.2                                  |
| 1250.0                                 | 104.1                                 | 106.6                                 | 108.6                                 | 107.4                                 | 105.8                                 | 101.6                                 |
| 1600.0                                 | 104.5                                 | 107.1                                 | 109.0                                 | 108.2                                 | 107.2                                 | 103.6                                 |
| 2000.0                                 | 104.8                                 | 108.6                                 | 109.7                                 | 109.1                                 | 108.2                                 | 104.8                                 |
| 2500.0                                 | 105.4                                 | 109.2                                 | 109.6                                 | 108.6                                 | 108.0                                 | 104.6                                 |
| 3150.0                                 | 105.4                                 | 108.9                                 | 108.9                                 | 107.3                                 | 107.0                                 | 104.5                                 |
| 4000.0                                 | 103.9                                 | 107.5                                 | 107.3                                 | 105.7                                 | 105.8                                 | 104.1                                 |
| 5000.0                                 | 101.0                                 | 104.7                                 | 104.5                                 | 102.9                                 | 104.3                                 | 103.5                                 |
| 6300.0                                 | 97.7                                  | 101.9                                 | 101.7                                 | 100.8                                 | 102.5                                 | 102.5                                 |
| 8000.0                                 | 95.2                                  | 99.6                                  | 99.6                                  | 99.3                                  | 101.2                                 | 101.5                                 |
| 10000.0                                | 93.0                                  | 97.3                                  | 97.5                                  | 97.4                                  | 99.9                                  | 100.7                                 |
| 12500.0                                | 91.0                                  | 95.6                                  | 95.7                                  | 95.7                                  | 98.5                                  | 99.5                                  |
| 16000.0                                | 89.3                                  | 93.9                                  | 93.9                                  | 93.9                                  | 96.9                                  | 98.2                                  |
| 20000.0                                | 87.1                                  | 91.9                                  | 91.9                                  | 91.8                                  | 94.7                                  | 96.5                                  |
| 25000.0                                | 85.1                                  | 90.4                                  | 90.2                                  | 90.1                                  | 92.9                                  | 95.0                                  |
| 31500.0                                | 82.1                                  | 87.5                                  | 87.5                                  | 87.3                                  | 90.3                                  | 92.8                                  |
| 40000.0                                | 79.9                                  | 85.0                                  | 84.6                                  | 85.1                                  | 88.0                                  | 91.3                                  |
| OVERALL<br>SPL                         | 114.4                                 | 117.4                                 | 118.0                                 | 116.8                                 | 116.4                                 | 114.1                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 75.3                                  | 74.3                                  | 74.5                                  | 74.2                                   | 74.6                                   | 74.5                                   |
| 250.0                                  | 77.6                                  | 76.8                                  | 75.6                                  | 75.0                                   | 75.6                                   | 75.5                                   |
| 315.2                                  | 80.3                                  | 78.2                                  | 78.2                                  | 78.3                                   | 77.6                                   | 77.8                                   |
| 400.0                                  | 84.1                                  | 81.0                                  | 80.6                                  | 80.2                                   | 79.8                                   | 78.7                                   |
| 500.0                                  | 86.5                                  | 83.3                                  | 82.5                                  | 81.8                                   | 81.4                                   | 81.0                                   |
| 630.0                                  | 89.6                                  | 86.4                                  | 85.3                                  | 84.2                                   | 83.8                                   | 83.3                                   |
| 800.0                                  | 92.7                                  | 89.0                                  | 87.2                                  | 86.3                                   | 86.0                                   | 85.2                                   |
| 1000.0                                 | 95.3                                  | 91.5                                  | 89.6                                  | 88.5                                   | 87.8                                   | 86.9                                   |
| 1250.0                                 | 97.8                                  | 93.7                                  | 92.0                                  | 90.2                                   | 89.9                                   | 89.0                                   |
| 1600.0                                 | 99.5                                  | 95.3                                  | 93.2                                  | 91.7                                   | 90.8                                   | 89.7                                   |
| 2000.0                                 | 100.6                                 | 97.0                                  | 94.8                                  | 93.1                                   | 92.1                                   | 91.3                                   |
| 2500.0                                 | 100.8                                 | 97.9                                  | 95.6                                  | 94.0                                   | 92.9                                   | 91.9                                   |
| 3150.0                                 | 101.7                                 | 98.7                                  | 96.8                                  | 95.0                                   | 94.0                                   | 93.1                                   |
| 4000.0                                 | 101.8                                 | 99.5                                  | 97.6                                  | 95.6                                   | 94.6                                   | 93.6                                   |
| 5000.0                                 | 102.0                                 | 99.9                                  | 97.7                                  | 95.8                                   | 95.0                                   | 93.9                                   |
| 6300.0                                 | 101.4                                 | 99.8                                  | 97.4                                  | 95.8                                   | 94.9                                   | 94.1                                   |
| 8000.0                                 | 101.0                                 | 99.9                                  | 97.3                                  | 95.4                                   | 94.8                                   | 94.0                                   |
| 10000.0                                | 100.5                                 | 99.5                                  | 96.8                                  | 95.3                                   | 94.5                                   | 93.9                                   |
| 12500.0                                | 99.7                                  | 99.0                                  | 96.6                                  | 94.7                                   | 94.0                                   | 93.5                                   |
| 16000.0                                | 98.5                                  | 98.4                                  | 96.2                                  | 93.9                                   | 93.5                                   | 93.0                                   |
| 20000.0                                | 96.9                                  | 96.9                                  | 95.2                                  | 92.8                                   | 92.4                                   | 91.4                                   |
| 25000.0                                | 95.4                                  | 95.9                                  | 94.6                                  | 91.8                                   | 91.5                                   | 90.5                                   |
| 31500.0                                | 93.0                                  | 93.6                                  | 92.9                                  | 89.7                                   | 89.6                                   | 88.4                                   |
| 40000.0                                | 91.0                                  | 92.2                                  | 91.4                                  | 87.9                                   | 88.4                                   | 86.6                                   |
| OVERALL<br>SPL                         | 112.0                                 | 110.1                                 | 108.0                                 | 106.1                                  | 105.4                                  | 104.5                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.84 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1375.00 DEG.F, CHAMBER TEMPERATURE = 110.00 DEG.F  
RELATIVE HUMIDITY = 23.0 PERCENT  
GAMMA = 1.340

RUN NUMBER 67

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.622  
TEMPERATURE RATIO TR = 3.219  
MACH NUMBER MJ = 0.876  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.848  
JET DENSITY RATIO DJ/D0 = 0.351  
JET VELOCITY RATIO VJ/A0 = 1.479  
JET VELOCITY VJ = 1730.4 FPS

TR/TJ = 1.131  
DR/D0 = 0.504  
DR/DJ = 1.434  
MASS FLOW = 0.951 POUNDS PER SECOND  
THRUST = 49.48 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 71.5                                   | 73.6                                   | 75.1                                   | 73.9                                    | 72.8                                    | 71.0                                    |
| 250.0                                  | 74.9                                   | 74.7                                   | 74.4                                   | 73.4                                    | 73.3                                    | 73.7                                    |
| 315.2                                  | 76.0                                   | 76.1                                   | 76.3                                   | 76.1                                    | 76.8                                    | 77.2                                    |
| 400.0                                  | 79.4                                   | 79.5                                   | 78.7                                   | 79.0                                    | 79.3                                    | 79.4                                    |
| 500.0                                  | 82.4                                   | 81.5                                   | 80.8                                   | 81.6                                    | 81.6                                    | 81.0                                    |
| 630.0                                  | 85.0                                   | 84.1                                   | 83.7                                   | 84.3                                    | 84.4                                    | 84.9                                    |
| 800.0                                  | 87.4                                   | 86.8                                   | 86.2                                   | 85.5                                    | 85.3                                    | 85.8                                    |
| 1000.0                                 | 89.8                                   | 88.9                                   | 87.3                                   | 86.5                                    | 85.9                                    | 86.1                                    |
| 1250.0                                 | 92.2                                   | 90.6                                   | 88.6                                   | 88.7                                    | 88.1                                    | 87.2                                    |
| 1600.0                                 | 93.5                                   | 91.0                                   | 89.9                                   | 89.5                                    | 88.8                                    | 88.4                                    |
| 2000.0                                 | 94.4                                   | 92.8                                   | 91.2                                   | 90.7                                    | 89.6                                    | 89.2                                    |
| 2500.0                                 | 94.9                                   | 93.5                                   | 91.8                                   | 91.4                                    | 90.8                                    | 90.1                                    |
| 3150.0                                 | 95.5                                   | 94.0                                   | 92.2                                   | 92.1                                    | 91.4                                    | 90.7                                    |
| 4000.0                                 | 95.9                                   | 94.5                                   | 92.6                                   | 92.4                                    | 91.6                                    | 90.9                                    |
| 5000.0                                 | 95.7                                   | 94.4                                   | 92.8                                   | 92.3                                    | 91.7                                    | 91.0                                    |
| 6300.0                                 | 95.6                                   | 95.0                                   | 92.7                                   | 92.5                                    | 91.9                                    | 91.2                                    |
| 8000.0                                 | 95.5                                   | 95.4                                   | 91.5                                   | 92.1                                    | 91.4                                    | 90.4                                    |
| 10000.0                                | 95.7                                   | 95.0                                   | 90.5                                   | 91.5                                    | 90.8                                    | 89.8                                    |
| 12500.0                                | 95.6                                   | 93.6                                   | 90.0                                   | 90.8                                    | 90.3                                    | 89.1                                    |
| 16000.0                                | 94.2                                   | 92.7                                   | 87.9                                   | 90.2                                    | 89.5                                    | 88.3                                    |
| 20000.0                                | 92.5                                   | 93.1                                   | 86.8                                   | 89.4                                    | 88.6                                    | 87.6                                    |
| 25000.0                                | 92.0                                   | 91.9                                   | 85.1                                   | 88.8                                    | 88.2                                    | 87.2                                    |
| 31500.0                                | 91.7                                   | 91.9                                   | 83.5                                   | 88.3                                    | 87.8                                    | 86.9                                    |
| 40000.0                                | 90.6                                   | 91.7                                   | 81.8                                   | 88.1                                    | 86.9                                    | 86.9                                    |
| OVERALL<br>SPL                         | 106.6                                  | 105.7                                  | 102.7                                  | 103.1                                   | 102.5                                   | 101.8                                   |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 7<br>ANGLE 35.3 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---------------------------------------|---|---|
| 200.0                                  | 70.0                                    | 0.0                                   | 71.0                                    | 72.2                                    |
| 250.0                                  | 74.2                                    | 0.0                                   | 74.3                                    | 74.2                                    |
| 315.2                                  | 77.2                                    | 0.0                                   | 75.1                                    | 74.7                                    |
| 400.0                                  | 77.8                                    | 0.0                                   | 76.4                                    | 77.5                                    |
| 500.0                                  | 80.5                                    | 0.0                                   | 78.9                                    | 78.4                                    |
| 630.0                                  | 84.8                                    | 0.0                                   | 80.8                                    | 78.5                                    |
| 800.0                                  | 85.8                                    | 0.0                                   | 82.8                                    | 80.4                                    |
| 1000.0                                 | 85.9                                    | 0.0                                   | 84.0                                    | 82.2                                    |
| 1250.0                                 | 86.5                                    | 0.0                                   | 85.6                                    | 83.3                                    |
| 1600.0                                 | 87.6                                    | 0.0                                   | 86.3                                    | 84.4                                    |
| 2000.0                                 | 89.0                                    | 0.0                                   | 87.4                                    | 85.1                                    |
| 2500.0                                 | 89.7                                    | 0.0                                   | 88.1                                    | 85.9                                    |
| 3150.0                                 | 89.9                                    | 0.0                                   | 88.4                                    | 86.4                                    |
| 4000.0                                 | 90.5                                    | 0.0                                   | 88.9                                    | 86.5                                    |
| 5000.0                                 | 90.3                                    | 0.0                                   | 88.7                                    | 86.3                                    |
| 6300.0                                 | 90.5                                    | 0.0                                   | 88.4                                    | 86.4                                    |
| 8000.0                                 | 90.1                                    | 0.0                                   | 87.6                                    | 85.7                                    |
| 10000.0                                | 89.5                                    | 0.0                                   | 86.6                                    | 84.7                                    |
| 12500.0                                | 88.8                                    | 0.0                                   | 85.6                                    | 83.8                                    |
| 16000.0                                | 88.1                                    | 0.0                                   | 85.0                                    | 82.3                                    |
| 20000.0                                | 87.3                                    | 0.0                                   | 83.7                                    | 80.8                                    |
| 25000.0                                | 86.6                                    | 0.0                                   | 83.0                                    | 79.4                                    |
| 31500.0                                | 86.0                                    | 0.0                                   | 82.3                                    | 78.4                                    |
| 40000.0                                | 85.3                                    | 0.0                                   | 81.4                                    | 77.2                                    |
| OVERALL<br>SPL                         | 101.3                                   | 0.0                                   | 99.1                                    | 96.9                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.84 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1375.00 DEG.F, CHAMBER TEMPERATURE = 110.00 DEG.F  
RELATIVE HUMIDITY = 23.0 PERCENT  
GAMMA = 1.340

RUN NUMBER 67

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.622  
TEMPERATURE RATIO TR = 3.219  
MACH NUMBER MJ = 0.876  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.848  
JET DENSITY RATIO DJ/D0 = 0.351  
JET VELOCITY RATIO VJ/A0 = 1.479  
JET VELOCITY VJ = 1730.4 FPS

TR/TJ = 1.131  
DR/D0 = 0.504  
DR/DJ = 1.434  
MASS FLOW = 0.951 POUNDS PER SECOND  
THRUST = 49.48 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 90.2                                  | 88.8                                  | 86.2                                  | 81.8                                  | 80.9                                  | 79.6                                  |
| 250.0                                  | 92.6                                  | 91.9                                  | 92.2                                  | 88.2                                  | 85.7                                  | 82.0                                  |
| 315.2                                  | 97.2                                  | 94.8                                  | 94.2                                  | 90.6                                  | 87.6                                  | 85.1                                  |
| 400.0                                  | 100.2                                 | 99.6                                  | 97.8                                  | 94.5                                  | 92.9                                  | 89.0                                  |
| 500.0                                  | 103.1                                 | 101.8                                 | 100.0                                 | 97.5                                  | 95.3                                  | 91.6                                  |
| 630.0                                  | 101.9                                 | 103.3                                 | 103.3                                 | 100.5                                 | 98.9                                  | 95.2                                  |
| 800.0                                  | 105.6                                 | 106.7                                 | 106.5                                 | 104.1                                 | 102.0                                 | 98.2                                  |
| 1000.0                                 | 104.8                                 | 106.7                                 | 108.7                                 | 107.1                                 | 105.1                                 | 101.3                                 |
| 1250.0                                 | 106.1                                 | 108.4                                 | 110.1                                 | 109.3                                 | 107.6                                 | 103.6                                 |
| 1600.0                                 | 106.8                                 | 108.8                                 | 110.8                                 | 110.4                                 | 109.8                                 | 105.7                                 |
| 2000.0                                 | 107.6                                 | 109.8                                 | 111.7                                 | 111.7                                 | 111.3                                 | 107.2                                 |
| 2500.0                                 | 108.4                                 | 111.0                                 | 113.2                                 | 112.1                                 | 111.8                                 | 107.9                                 |
| 3150.0                                 | 108.9                                 | 111.7                                 | 113.5                                 | 111.9                                 | 111.1                                 | 107.7                                 |
| 4000.0                                 | 108.5                                 | 111.7                                 | 113.1                                 | 111.0                                 | 110.2                                 | 107.0                                 |
| 5000.0                                 | 106.3                                 | 109.8                                 | 111.0                                 | 108.9                                 | 108.7                                 | 106.3                                 |
| 6300.0                                 | 103.9                                 | 107.8                                 | 108.7                                 | 106.7                                 | 107.2                                 | 105.3                                 |
| 8000.0                                 | 101.5                                 | 105.7                                 | 107.0                                 | 105.0                                 | 106.0                                 | 104.0                                 |
| 10000.0                                | 99.6                                  | 102.8                                 | 104.0                                 | 102.7                                 | 104.5                                 | 103.0                                 |
| 12500.0                                | 96.9                                  | 101.4                                 | 103.5                                 | 101.3                                 | 103.5                                 | 102.1                                 |
| 16000.0                                | 94.9                                  | 99.4                                  | 101.7                                 | 99.7                                  | 102.0                                 | 100.8                                 |
| 20000.0                                | 92.3                                  | 97.3                                  | 99.9                                  | 97.5                                  | 100.0                                 | 99.2                                  |
| 25000.0                                | 89.9                                  | 95.3                                  | 98.3                                  | 95.4                                  | 97.9                                  | 97.6                                  |
| 31500.0                                | 87.4                                  | 93.1                                  | 96.4                                  | 93.0                                  | 95.5                                  | 95.5                                  |
| 40000.0                                | 85.3                                  | 91.6                                  | 94.5                                  | 90.9                                  | 93.2                                  | 93.9                                  |
| OVERALL<br>SPL                         | 117.7                                 | 120.2                                 | 121.8                                 | 120.4                                 | 120.0                                 | 116.8                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 77.2                                  | 75.8                                  | 75.4                                  | 74.2                                   | 75.1                                   | 74.2                                   |
| 250.0                                  | 80.6                                  | 78.1                                  | 77.3                                  | 76.6                                   | 77.4                                   | 76.8                                   |
| 315.2                                  | 81.6                                  | 79.8                                  | 79.0                                  | 79.0                                   | 78.6                                   | 77.6                                   |
| 400.0                                  | 85.6                                  | 83.6                                  | 81.8                                  | 81.2                                   | 81.4                                   | 80.1                                   |
| 500.0                                  | 87.8                                  | 85.5                                  | 83.2                                  | 81.9                                   | 82.3                                   | 81.4                                   |
| 630.0                                  | 91.1                                  | 88.1                                  | 86.5                                  | 85.4                                   | 84.8                                   | 83.9                                   |
| 800.0                                  | 94.2                                  | 90.9                                  | 88.6                                  | 87.4                                   | 87.3                                   | 86.8                                   |
| 1000.0                                 | 97.0                                  | 93.3                                  | 91.4                                  | 89.5                                   | 88.6                                   | 88.1                                   |
| 1250.0                                 | 99.3                                  | 95.4                                  | 93.0                                  | 91.6                                   | 90.4                                   | 89.8                                   |
| 1600.0                                 | 101.2                                 | 97.3                                  | 94.7                                  | 92.8                                   | 92.0                                   | 90.8                                   |
| 2000.0                                 | 102.6                                 | 99.1                                  | 96.4                                  | 94.2                                   | 93.3                                   | 92.3                                   |
| 2500.0                                 | 103.7                                 | 100.6                                 | 97.8                                  | 95.4                                   | 94.6                                   | 93.6                                   |
| 3150.0                                 | 104.3                                 | 101.5                                 | 98.5                                  | 96.5                                   | 95.6                                   | 94.6                                   |
| 4000.0                                 | 104.6                                 | 102.0                                 | 99.5                                  | 97.2                                   | 96.0                                   | 95.1                                   |
| 5000.0                                 | 104.9                                 | 102.6                                 | 99.8                                  | 97.4                                   | 96.4                                   | 95.4                                   |
| 6300.0                                 | 104.7                                 | 102.7                                 | 99.6                                  | 97.6                                   | 96.7                                   | 95.8                                   |
| 8000.0                                 | 104.3                                 | 102.7                                 | 99.5                                  | 97.5                                   | 96.7                                   | 95.9                                   |
| 10000.0                                | 103.7                                 | 102.2                                 | 98.9                                  | 97.2                                   | 96.4                                   | 96.0                                   |
| 12500.0                                | 102.9                                 | 101.7                                 | 98.5                                  | 96.8                                   | 95.8                                   | 95.3                                   |
| 16000.0                                | 102.0                                 | 101.1                                 | 98.3                                  | 96.1                                   | 95.5                                   | 94.9                                   |
| 20000.0                                | 100.6                                 | 99.6                                  | 97.4                                  | 95.0                                   | 94.4                                   | 93.7                                   |
| 25000.0                                | 99.2                                  | 98.2                                  | 96.6                                  | 93.6                                   | 93.3                                   | 92.4                                   |
| 31500.0                                | 96.8                                  | 96.3                                  | 95.0                                  | 91.7                                   | 91.7                                   | 90.6                                   |
| 40000.0                                | 94.9                                  | 94.7                                  | 93.2                                  | 89.7                                   | 90.6                                   | 88.8                                   |
| OVERALL<br>SPL                         | 114.8                                 | 112.7                                 | 110.0                                 | 107.8                                  | 107.0                                  | 106.2                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 8.71 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1225.00 DEG.F, CHAMBER TEMPERATURE = 59.00 DEG.F  
RELATIVE HUMIDITY = 49.0 PERCENT  
GAMMA = 1.340

RUN NUMBER 169

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.621  
TEMPERATURE RATIO TR = 3.247  
MACH NUMBER MJ = 0.876  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.872  
JET DENSITY RATIO DJ/D0 = 0.348  
JET VELOCITY RATIO VJ/A0 = 1.484  
JET VELOCITY VJ = 1657.7 FPS

TR/TJ = 1.130  
DR/D0 = 0.499  
DR/DJ = 1.434  
MASS FLOW = 0.946 POUNDS PER SECOND  
THRUST = 49.46 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|--|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
|  | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|  | 10             | 82.5  | 11             | 90.0  | 12             | 97.5  | 13             | 105.0 | 14             | 112.5 | 15             | 120.0 |
| 200.0                                  | 73.6           |       | 75.5           |       | 76.3           |       | 75.5           |       | 74.7           |       | 73.0           |       |
| 250.0                                  | 76.6           |       | 76.5           |       | 76.1           |       | 74.5           |       | 74.7           |       | 74.8           |       |
| 315.2                                  | 77.8           |       | 78.3           |       | 77.7           |       | 77.9           |       | 78.1           |       | 78.1           |       |
| 400.0                                  | 81.0           |       | 80.7           |       | 80.5           |       | 80.5           |       | 81.4           |       | 80.7           |       |
| 500.0                                  | 84.4           |       | 83.2           |       | 83.5           |       | 83.5           |       | 83.6           |       | 83.0           |       |
| 630.0                                  | 86.5           |       | 85.6           |       | 86.3           |       | 85.9           |       | 86.6           |       | 86.7           |       |
| 800.0                                  | 88.7           |       | 88.6           |       | 88.6           |       | 87.1           |       | 87.2           |       | 88.1           |       |
| 1000.0                                 | 91.2           |       | 90.5           |       | 89.4           |       | 88.1           |       | 87.4           |       | 87.5           |       |
| 1250.0                                 | 93.8           |       | 92.6           |       | 90.8           |       | 90.1           |       | 89.6           |       | 88.7           |       |
| 1600.0                                 | 95.5           |       | 93.2           |       | 92.2           |       | 91.0           |       | 90.0           |       | 89.9           |       |
| 2000.0                                 | 96.6           |       | 94.7           |       | 93.3           |       | 92.4           |       | 91.7           |       | 90.8           |       |
| 2500.0                                 | 97.1           |       | 95.9           |       | 94.4           |       | 93.3           |       | 93.0           |       | 91.7           |       |
| 3150.0                                 | 97.6           |       | 96.3           |       | 95.1           |       | 94.1           |       | 93.3           |       | 92.6           |       |
| 4000.0                                 | 98.2           |       | 97.0           |       | 95.5           |       | 94.5           |       | 93.9           |       | 92.9           |       |
| 5000.0                                 | 98.1           |       | 97.1           |       | 95.8           |       | 94.5           |       | 94.0           |       | 93.0           |       |
| 6300.0                                 | 98.3           |       | 97.7           |       | 96.1           |       | 94.8           |       | 94.3           |       | 93.7           |       |
| 8000.0                                 | 98.3           |       | 98.2           |       | 95.4           |       | 94.3           |       | 93.8           |       | 92.9           |       |
| 10000.0                                | 98.5           |       | 98.1           |       | 94.8           |       | 93.9           |       | 93.4           |       | 92.3           |       |
| 12500.0                                | 98.5           |       | 97.0           |       | 95.0           |       | 93.6           |       | 93.1           |       | 91.8           |       |
| 16000.0                                | 97.3           |       | 95.8           |       | 93.6           |       | 92.8           |       | 92.3           |       | 91.1           |       |
| 20000.0                                | 95.7           |       | 96.3           |       | 93.4           |       | 92.1           |       | 91.5           |       | 90.4           |       |
| 25000.0                                | 95.2           |       | 95.5           |       | 92.9           |       | 91.7           |       | 91.1           |       | 90.1           |       |
| 31500.0                                | 94.8           |       | 95.3           |       | 92.7           |       | 91.1           |       | 90.8           |       | 89.9           |       |
| 40000.0                                | 93.6           |       | 95.1           |       | 92.3           |       | 90.9           |       | 89.9           |       | 89.9           |       |
| OVERALL                                |                |       |                |       |                |       |                |       |                |       |                |       |
| SPL                                    | 109.2          |       | 108.5          |       | 106.5          |       | 105.4          |       | 104.9          |       | 104.0          |       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 7     | 35.3  |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 70.9  | 0.0   | 72.1  | 72.8  |
| 250.0   | 75.3  | 0.0   | 75.3  | 76.0  |
| 315.2   | 78.6  | 0.0   | 76.8  | 76.6  |
| 400.0   | 79.6  | 0.0   | 78.5  | 79.4  |
| 500.0   | 82.8  | 0.0   | 80.9  | 80.3  |
| 630.0   | 87.4  | 0.0   | 83.2  | 80.2  |
| 800.0   | 87.8  | 0.0   | 84.9  | 81.5  |
| 1000.0  | 87.7  | 0.0   | 85.6  | 84.1  |
| 1250.0  | 88.2  | 0.0   | 87.8  | 85.0  |
| 1600.0  | 89.3  | 0.0   | 88.3  | 86.3  |
| 2000.0  | 90.7  | 0.0   | 89.6  | 86.8  |
| 2500.0  | 91.4  | 0.0   | 90.3  | 88.0  |
| 3150.0  | 92.1  | 0.0   | 90.4  | 88.6  |
| 4000.0  | 92.6  | 0.0   | 91.2  | 88.9  |
| 5000.0  | 92.7  | 0.0   | 90.9  | 88.8  |
| 6300.0  | 92.8  | 0.0   | 90.8  | 89.0  |
| 8000.0  | 92.7  | 0.0   | 90.1  | 88.5  |
| 10000.0 | 92.1  | 0.0   | 89.1  | 87.4  |
| 12500.0 | 91.5  | 0.0   | 88.2  | 86.5  |
| 16000.0 | 90.9  | 0.0   | 87.4  | 85.0  |
| 20000.0 | 90.1  | 0.0   | 86.3  | 83.4  |
| 25000.0 | 89.5  | 0.0   | 85.6  | 82.1  |
| 31500.0 | 88.8  | 0.0   | 84.9  | 80.3  |
| 40000.0 | 88.1  | 0.0   | 84.0  | 79.5  |
| OVERALL |       |       |       |       |
| SPL     | 103.6 | 0.0   | 101.4 | 99.2  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.34 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1475.00 DEG.F, CHAMBER TEMPERATURE = 109.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 97

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.024  
TEMPERATURE RATIO TR = 3.401  
MACH NUMBER MJ = 0.189  
JET STATIC TEMPERATURE RATIO TJ/TO = 3.381  
JET DENSITY RATIO DJ/DO = 0.296  
JET VELOCITY RATIO VJ/A0 = 0.347  
JET VELOCITY VJ = 405.9 FPS

TR/TJ = 1.006  
DR/DO = 0.301  
DR/DJ = 1.018  
MASS FLOW = 0.188 POUNDS PER SECOND  
THRUST = 2.30 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 62.0  |       | 63.9  |       | 62.1  | 63.2  |
| 250.0   | 64.7  |       | 67.6  |       | 67.3  | 66.5  |
| 315.2   | 65.9  |       | 68.4  |       | 67.8  | 67.4  |
| 400.0   | 68.1  |       | 70.7  |       | 68.5  | 69.0  |
| 500.0   | 67.4  |       | 68.0  |       | 67.6  | 66.8  |
| 630.0   | 63.5  |       | 67.2  |       | 66.9  | 67.0  |
| 800.0   | 64.3  |       | 67.3  |       | 66.9  | 66.6  |
| 1000.0  | 62.3  |       | 65.6  |       | 65.9  | 67.0  |
| 1250.0  | 61.4  |       | 64.1  |       | 65.6  | 65.9  |
| 1600.0  | 59.2  |       | 61.4  |       | 63.2  | 63.9  |
| 2000.0  | 57.9  |       | 59.5  |       | 61.1  | 62.8  |
| 2500.0  | 56.5  |       | 56.8  |       | 58.6  | 60.8  |
| 3150.0  | 55.5  |       | 54.8  |       | 57.1  | 59.5  |
| 4000.0  | 55.6  |       | 54.5  |       | 55.1  | 57.6  |
| 5000.0  | 56.2  |       | 54.5  |       | 53.6  | 55.7  |
| 6300.0  | 56.4  |       | 52.8  |       | 52.5  | 55.1  |
| 8000.0  | 57.8  |       | 51.6  |       | 51.6  | 53.7  |
| 10000.0 | 58.1  |       | 49.4  |       | 50.8  | 53.1  |
| 12500.0 | 59.1  |       | 49.3  |       | 50.1  | 51.6  |
| 16000.0 | 59.9  |       | 49.4  |       | 49.6  | 51.0  |
| 20000.0 | 60.6  |       | 47.0  |       | 47.9  | 48.8  |
| 25000.0 | 62.0  |       | 45.5  |       | 46.4  | 46.8  |
| 31500.0 | 63.5  |       | 44.9  |       | 45.4  | 44.3  |
| 40000.0 | 66.2  |       | 46.3  |       | 46.5  | 44.4  |
| OVERALL |       |       |       |       |       |       |
| SPL     | 76.4  |       | 77.4  |       | 76.9  | 77.1  |
|         |       |       |       |       | 76.9  | 77.1  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 60.7                                  | 60.5                                  | 60.9                                  | 61.0                                   | 60.6                                   | 60.9                                   |
| 250.0                                  | 62.2                                  | 62.6                                  | 61.3                                  | 61.0                                   | 61.4                                   | 60.8                                   |
| 315.2                                  | 60.6                                  | 62.6                                  | 61.6                                  | 62.0                                   | 60.9                                   | 61.7                                   |
| 400.0                                  | 62.7                                  | 63.8                                  | 63.6                                  | 63.6                                   | 62.1                                   | 62.1                                   |
| 500.0                                  | 62.4                                  | 62.2                                  | 61.0                                  | 60.3                                   | 60.0                                   | 58.4                                   |
| 630.0                                  | 62.4                                  | 62.2                                  | 61.6                                  | 60.8                                   | 60.2                                   | 59.9                                   |
| 800.0                                  | 63.0                                  | 62.6                                  | 62.0                                  | 61.5                                   | 60.5                                   | 60.2                                   |
| 1000.0                                 | 63.1                                  | 62.7                                  | 62.2                                  | 61.9                                   | 61.3                                   | 60.1                                   |
| 1250.0                                 | 62.5                                  | 62.8                                  | 62.2                                  | 61.7                                   | 60.8                                   | 60.5                                   |
| 1600.0                                 | 61.8                                  | 61.9                                  | 61.4                                  | 60.8                                   | 60.4                                   | 59.8                                   |
| 2000.0                                 | 61.3                                  | 61.8                                  | 61.0                                  | 60.6                                   | 60.1                                   | 59.4                                   |
| 2500.0                                 | 61.6                                  | 61.1                                  | 60.5                                  | 60.4                                   | 59.9                                   | 59.6                                   |
| 3150.0                                 | 61.8                                  | 61.2                                  | 60.4                                  | 60.1                                   | 59.8                                   | 59.6                                   |
| 4000.0                                 | 61.6                                  | 60.8                                  | 60.1                                  | 59.5                                   | 59.3                                   | 59.4                                   |
| 5000.0                                 | 61.2                                  | 59.9                                  | 59.2                                  | 58.8                                   | 58.9                                   | 59.1                                   |
| 6300.0                                 | 61.7                                  | 59.7                                  | 58.9                                  | 59.0                                   | 58.8                                   | 58.9                                   |
| 8000.0                                 | 61.9                                  | 59.4                                  | 58.4                                  | 59.1                                   | 58.8                                   | 58.7                                   |
| 10000.0                                | 62.4                                  | 58.9                                  | 57.9                                  | 58.5                                   | 58.4                                   | 58.7                                   |
| 12500.0                                | 62.9                                  | 58.4                                  | 57.5                                  | 58.2                                   | 58.0                                   | 58.7                                   |
| 16000.0                                | 63.5                                  | 58.0                                  | 57.3                                  | 57.5                                   | 57.7                                   | 58.3                                   |
| 20000.0                                | 63.6                                  | 56.3                                  | 55.8                                  | 55.7                                   | 55.9                                   | 56.8                                   |
| 25000.0                                | 64.9                                  | 54.5                                  | 54.2                                  | 53.4                                   | 54.1                                   | 55.2                                   |
| 31500.0                                | 65.8                                  | 51.6                                  | 51.4                                  | 50.1                                   | 51.2                                   | 52.7                                   |
| 40000.0                                | 68.2                                  | 49.6                                  | 49.0                                  | 47.7                                   | 49.2                                   | 51.2                                   |
| OVERALL<br>SPL                         | 76.9                                  | 74.6                                  | 73.9                                  | 73.7                                   | 73.2                                   | 73.1                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.34 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1318.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 59.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 228

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.024$   
TEMPERATURE RATIO  $TR = 3.419$   
MACH NUMBER  $MJ = 0.189$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 3.399$   
JET DENSITY RATIO  $DJ/DO = 0.294$   
JET VELOCITY RATIO  $VJ/A0 = 0.349$   
JET VELOCITY  $VJ = 389.6$  FPS

$TR/TJ = 1.006$   
 $DR/DO = 0.299$   
 $DR/DJ = 1.018$   
MASS FLOW = 0.188 POUNDS PER SECOND  
THRUST = 2.30 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 53.3                                   | 56.5                                   | 57.6                                   | 56.8                                    | 57.0                                    | 55.2                                    |
| 250.0                                  | 58.2                                   | 58.2                                   | 57.2                                   | 57.0                                    | 57.5                                    | 57.2                                    |
| 315.2                                  | 61.0                                   | 61.3                                   | 60.7                                   | 60.0                                    | 60.1                                    | 60.2                                    |
| 400.0                                  | 62.6                                   | 62.2                                   | 61.9                                   | 61.7                                    | 60.2                                    | 60.7                                    |
| 500.0                                  | 61.9                                   | 62.3                                   | 61.5                                   | 61.0                                    | 60.2                                    | 59.7                                    |
| 630.0                                  | 61.7                                   | 61.3                                   | 61.0                                   | 60.8                                    | 61.2                                    | 60.1                                    |
| 800.0                                  | 63.2                                   | 63.8                                   | 62.8                                   | 62.0                                    | 60.9                                    | 60.6                                    |
| 1000.0                                 | 63.6                                   | 63.8                                   | 63.1                                   | 62.4                                    | 61.0                                    | 60.9                                    |
| 1250.0                                 | 62.4                                   | 62.8                                   | 62.8                                   | 61.7                                    | 60.6                                    | 59.8                                    |
| 1600.0                                 | 61.0                                   | 61.9                                   | 61.4                                   | 60.1                                    | 58.8                                    | 58.5                                    |
| 2000.0                                 | 59.7                                   | 61.0                                   | 60.7                                   | 59.7                                    | 58.7                                    | 58.1                                    |
| 2500.0                                 | 58.8                                   | 60.5                                   | 59.9                                   | 59.6                                    | 58.8                                    | 58.1                                    |
| 3150.0                                 | 58.0                                   | 59.5                                   | 59.9                                   | 59.7                                    | 58.7                                    | 58.2                                    |
| 4000.0                                 | 57.7                                   | 59.2                                   | 59.9                                   | 59.2                                    | 58.7                                    | 57.7                                    |
| 5000.0                                 | 56.8                                   | 59.1                                   | 59.4                                   | 58.9                                    | 58.5                                    | 57.5                                    |
| 6300.0                                 | 56.9                                   | 59.2                                   | 59.2                                   | 58.8                                    | 58.8                                    | 57.7                                    |
| 8000.0                                 | 57.2                                   | 59.5                                   | 58.2                                   | 58.4                                    | 57.8                                    | 56.9                                    |
| 10000.0                                | 57.9                                   | 59.4                                   | 58.9                                   | 58.4                                    | 57.4                                    | 56.3                                    |
| 12500.0                                | 57.7                                   | 58.4                                   | 58.2                                   | 57.7                                    | 57.3                                    | 56.0                                    |
| 16000.0                                | 56.6                                   | 57.9                                   | 57.1                                   | 57.2                                    | 56.5                                    | 55.5                                    |
| 20000.0                                | 55.4                                   | 58.1                                   | 57.2                                   | 56.4                                    | 55.9                                    | 54.9                                    |
| 25000.0                                | 53.7                                   | 56.0                                   | 55.6                                   | 55.2                                    | 53.8                                    | 53.8                                    |
| 31500.0                                | 53.4                                   | 55.1                                   | 54.7                                   | 54.1                                    | 52.6                                    | 52.5                                    |
| 40000.0                                | 51.4                                   | 54.3                                   | 53.6                                   | 53.9                                    | 51.7                                    | 52.6                                    |
| OVERALL<br>SPL                         | 73.3                                   | 74.1                                   | 73.7                                   | 73.2                                    | 72.4                                    | 71.9                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 56.7  |       | 58.7  |       | 57.1  |       | 57.9  |       |  |
| 250.0   | 57.2  |       | 58.0  |       | 57.4  |       | 57.6  |       |  |
| 315.2   | 60.5  |       | 60.5  |       | 58.4  |       | 57.9  |       |  |
| 400.0   | 61.2  |       | 61.8  |       | 60.5  |       | 59.5  |       |  |
| 500.0   | 61.3  |       | 60.8  |       | 59.6  |       | 58.9  |       |  |
| 630.0   | 60.8  |       | 60.5  |       | 59.4  |       | 58.6  |       |  |
| 800.0   | 61.3  |       | 61.3  |       | 59.0  |       | 58.7  |       |  |
| 1000.0  | 61.6  |       | 60.9  |       | 59.8  |       | 58.1  |       |  |
| 1250.0  | 60.1  |       | 59.7  |       | 57.8  |       | 56.0  |       |  |
| 1600.0  | 59.0  |       | 57.8  |       | 55.6  |       | 53.7  |       |  |
| 2000.0  | 58.6  |       | 57.9  |       | 54.7  |       | 52.2  |       |  |
| 2500.0  | 58.2  |       | 57.3  |       | 54.3  |       | 51.4  |       |  |
| 3150.0  | 58.2  |       | 57.3  |       | 53.8  |       | 50.5  |       |  |
| 4000.0  | 58.1  |       | 56.9  |       | 53.6  |       | 49.6  |       |  |
| 5000.0  | 58.0  |       | 56.3  |       | 52.6  |       | 48.1  |       |  |
| 6300.0  | 57.8  |       | 56.3  |       | 52.1  |       | 47.3  |       |  |
| 8000.0  | 56.9  |       | 55.1  |       | 50.6  |       | 45.2  |       |  |
| 10000.0 | 55.8  |       | 54.4  |       | 49.9  |       | 43.2  |       |  |
| 12500.0 | 55.7  |       | 52.9  |       | 47.9  |       | 41.5  |       |  |
| 16000.0 | 55.2  |       | 52.3  |       | 47.3  |       | 41.9  |       |  |
| 20000.0 | 55.1  |       | 51.5  |       | 48.5  |       | 45.9  |       |  |
| 25000.0 | 52.6  |       | 49.6  |       | 43.3  |       | 38.2  |       |  |
| 31500.0 | 51.1  |       | 48.3  |       | 41.7  |       | 39.4  |       |  |
| 40000.0 | 50.2  |       | 48.1  |       | 42.3  |       | 44.7  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 72.3  |       | 71.7  |       | 69.6  |       | 68.5  |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.46 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1475.00 DEG.F, CHAMBER TEMPERATURE = 112.00 DEG.F  
RELATIVE HUMIDITY = 24.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 98

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R$  = 1.032  
TEMPERATURE RATIO  $T_R$  = 3.383  
MACH NUMBER  $M_J$  = 0.219  
JET STATIC TEMPERATURE RATIO  $T_J/T_0$  = 3.356  
JET DENSITY RATIO  $\rho_J/\rho_0$  = 0.298  
JET VELOCITY RATIO  $V_J/A_0$  = 0.402  
JET VELOCITY  $V_J$  = 470.9 FPS

$T_R/T_J$  = 1.008  
 $\rho_R/\rho_0$  = 0.305  
 $\rho_R/\rho_J$  = 1.024  
MASS FLOW = 0.219 POUNDS PER SECOND  
THRUST = 3.10 POUNDS

SHOCK CELL LENGTH  $S$  = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 66.0                                  | 64.6                                  | 63.9                                  | 62.5                                  | 61.8                                  | 59.5                                  |
| 250.0                                  | 68.0                                  | 68.9                                  | 68.4                                  | 65.7                                  | 64.8                                  | 63.2                                  |
| 315.2                                  | 70.8                                  | 70.1                                  | 71.5                                  | 68.6                                  | 67.2                                  | 62.8                                  |
| 400.0                                  | 72.2                                  | 73.6                                  | 71.9                                  | 70.5                                  | 68.7                                  | 63.9                                  |
| 500.0                                  | 72.9                                  | 72.0                                  | 71.9                                  | 70.1                                  | 69.2                                  | 65.9                                  |
| 630.0                                  | 69.0                                  | 71.2                                  | 71.6                                  | 70.5                                  | 69.0                                  | 66.7                                  |
| 800.0                                  | 70.1                                  | 71.4                                  | 71.0                                  | 70.3                                  | 69.8                                  | 65.6                                  |
| 1000.0                                 | 66.7                                  | 69.4                                  | 70.4                                  | 69.8                                  | 69.3                                  | 67.0                                  |
| 1250.0                                 | 65.0                                  | 68.1                                  | 69.8                                  | 69.6                                  | 69.2                                  | 67.2                                  |
| 1600.0                                 | 61.9                                  | 65.6                                  | 67.2                                  | 67.6                                  | 68.2                                  | 66.3                                  |
| 2000.0                                 | 59.3                                  | 63.4                                  | 65.6                                  | 66.1                                  | 67.3                                  | 66.1                                  |
| 2500.0                                 | 55.9                                  | 61.0                                  | 62.8                                  | 64.4                                  | 66.4                                  | 65.4                                  |
| 3150.0                                 | 52.9                                  | 58.3                                  | 60.8                                  | 62.8                                  | 65.6                                  | 65.5                                  |
| 4000.0                                 | 54.1                                  | 57.8                                  | 58.5                                  | 61.0                                  | 64.4                                  | 64.5                                  |
| 5000.0                                 | 53.8                                  | 57.9                                  | 57.0                                  | 59.3                                  | 62.9                                  | 64.0                                  |
| 6300.0                                 | 52.9                                  | 56.1                                  | 55.7                                  | 57.9                                  | 62.1                                  | 63.6                                  |
| 8000.0                                 | 53.5                                  | 55.1                                  | 55.0                                  | 57.0                                  | 61.0                                  | 64.0                                  |
| 10000.0                                | 52.4                                  | 52.1                                  | 54.2                                  | 56.0                                  | 60.0                                  | 63.1                                  |
| 12500.0                                | 51.5                                  | 51.9                                  | 53.1                                  | 55.1                                  | 59.6                                  | 63.1                                  |
| 16000.0                                | 51.3                                  | 51.7                                  | 53.0                                  | 54.5                                  | 59.2                                  | 63.0                                  |
| 20000.0                                | 48.0                                  | 49.8                                  | 51.3                                  | 52.6                                  | 58.1                                  | 63.0                                  |
| 25000.0                                | 45.6                                  | 48.0                                  | 49.7                                  | 50.8                                  | 57.6                                  | 64.2                                  |
| 31500.0                                | 46.3                                  | 47.0                                  | 47.9                                  | 48.0                                  | 57.4                                  | 65.0                                  |
| 40000.0                                | 49.3                                  | 48.2                                  | 48.9                                  | 46.6                                  | 59.6                                  | 67.8                                  |
| OVERALL<br>SPL                         | 79.5                                  | 80.5                                  | 80.7                                  | 79.7                                  | 79.7                                  | 78.8                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 59.2                                  | 60.2                                  | 60.3                                  | 59.7                                   | 60.1                                   | 60.2                                   |
| 250.0                                  | 61.0                                  | 62.1                                  | 59.8                                  | 60.8                                   | 60.3                                   | 60.2                                   |
| 315.2                                  | 62.4                                  | 62.2                                  | 61.4                                  | 61.6                                   | 61.0                                   | 61.8                                   |
| 400.0                                  | 64.5                                  | 65.1                                  | 63.8                                  | 63.9                                   | 61.9                                   | 61.5                                   |
| 500.0                                  | 64.9                                  | 65.2                                  | 63.8                                  | 62.7                                   | 62.4                                   | 61.7                                   |
| 630.0                                  | 65.0                                  | 65.2                                  | 64.0                                  | 63.5                                   | 63.0                                   | 62.8                                   |
| 800.0                                  | 66.2                                  | 65.8                                  | 64.9                                  | 64.2                                   | 62.9                                   | 62.8                                   |
| 1000.0                                 | 66.1                                  | 66.0                                  | 65.0                                  | 64.7                                   | 63.6                                   | 63.2                                   |
| 1250.0                                 | 66.6                                  | 66.3                                  | 65.6                                  | 65.0                                   | 64.2                                   | 63.6                                   |
| 1600.0                                 | 65.3                                  | 65.6                                  | 64.7                                  | 64.0                                   | 63.5                                   | 63.0                                   |
| 2000.0                                 | 65.3                                  | 65.7                                  | 64.6                                  | 64.2                                   | 63.5                                   | 63.0                                   |
| 2500.0                                 | 64.9                                  | 65.0                                  | 63.7                                  | 63.4                                   | 63.2                                   | 62.8                                   |
| 3150.0                                 | 65.1                                  | 64.8                                  | 63.7                                  | 63.5                                   | 63.4                                   | 62.7                                   |
| 4000.0                                 | 64.7                                  | 64.7                                  | 63.3                                  | 62.9                                   | 62.8                                   | 62.5                                   |
| 5000.0                                 | 64.3                                  | 63.5                                  | 62.5                                  | 62.4                                   | 62.5                                   | 62.4                                   |
| 6300.0                                 | 64.0                                  | 63.0                                  | 61.8                                  | 62.5                                   | 62.3                                   | 62.2                                   |
| 8000.0                                 | 63.6                                  | 62.7                                  | 61.5                                  | 62.3                                   | 62.3                                   | 62.1                                   |
| 10000.0                                | 63.5                                  | 62.1                                  | 61.0                                  | 61.6                                   | 62.0                                   | 62.0                                   |
| 12500.0                                | 63.4                                  | 62.0                                  | 60.8                                  | 61.7                                   | 61.9                                   | 61.9                                   |
| 16000.0                                | 63.5                                  | 61.4                                  | 60.6                                  | 61.1                                   | 61.7                                   | 61.6                                   |
| 20000.0                                | 62.9                                  | 60.1                                  | 59.4                                  | 59.7                                   | 60.5                                   | 60.5                                   |
| 25000.0                                | 62.4                                  | 58.7                                  | 58.1                                  | 58.1                                   | 59.1                                   | 59.0                                   |
| 31500.0                                | 61.8                                  | 55.9                                  | 55.6                                  | 55.4                                   | 56.4                                   | 56.4                                   |
| 40000.0                                | 62.8                                  | 53.9                                  | 53.0                                  | 53.1                                   | 54.0                                   | 54.0                                   |
| OVERALL<br>SPL                         | 78.0                                  | 77.5                                  | 76.4                                  | 76.2                                   | 75.9                                   | 75.6                                   |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.45 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1330.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 60.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 229

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.032  
TEMPERATURE RATIO TR = 3.442  
MACH NUMBER MJ = 0.217  
JET STATIC TEMPERATURE RATIO TJ/T0 = 3.416  
JET DENSITY RATIO DJ/D0 = 0.293  
JET VELOCITY RATIO VJ/A0 = 0.401  
JET VELOCITY VJ = 448.6 FPS

TR/TJ = 1.008  
DR/D0 = 0.300  
DR/DJ = 1.024  
MASS FLOW = 0.215 POUNDS PER SECOND  
THRUST = 3.04 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10 | ANGLE<br>82.5 | MICRO<br>PHONE<br>NO. 11 | ANGLE<br>90.0 | MICRO<br>PHONE<br>NO. 12 | ANGLE<br>97.5 | MICRO<br>PHONE<br>NO. 13 | ANGLE<br>105.0 | MICRO<br>PHONE<br>NO. 14 | ANGLE<br>112.5 | MICRO<br>PHONE<br>NO. 15 | ANGLE<br>120.0 |
|--|--------------------------|---------------|--------------------------|---------------|--------------------------|---------------|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|
| 200.0                                  | 56.0                     |               | 57.7                     |               | 60.1                     |               | 59.3                     |                | 58.7                     |                | 57.0                     |                |
| 250.0                                  | 59.2                     |               | 60.4                     |               | 59.6                     |               | 59.7                     |                | 59.6                     |                | 59.5                     |                |
| 315.2                                  | 62.6                     |               | 62.7                     |               | 62.8                     |               | 63.3                     |                | 62.5                     |                | 62.4                     |                |
| 400.0                                  | 65.0                     |               | 64.5                     |               | 63.6                     |               | 63.8                     |                | 64.2                     |                | 62.4                     |                |
| 500.0                                  | 65.6                     |               | 64.0                     |               | 64.3                     |               | 64.0                     |                | 63.5                     |                | 62.8                     |                |
| 630.0                                  | 65.8                     |               | 64.4                     |               | 64.4                     |               | 64.8                     |                | 64.2                     |                | 63.5                     |                |
| 800.0                                  | 67.0                     |               | 65.8                     |               | 65.7                     |               | 64.9                     |                | 64.7                     |                | 64.3                     |                |
| 1000.0                                 | 66.9                     |               | 65.7                     |               | 66.0                     |               | 65.6                     |                | 65.0                     |                | 64.6                     |                |
| 1250.0                                 | 66.4                     |               | 65.7                     |               | 65.6                     |               | 65.5                     |                | 64.5                     |                | 63.7                     |                |
| 1600.0                                 | 65.0                     |               | 64.5                     |               | 64.8                     |               | 64.5                     |                | 63.9                     |                | 62.5                     |                |
| 2000.0                                 | 64.2                     |               | 63.7                     |               | 64.3                     |               | 64.0                     |                | 63.3                     |                | 62.5                     |                |
| 2500.0                                 | 63.2                     |               | 62.8                     |               | 63.4                     |               | 63.5                     |                | 63.0                     |                | 62.4                     |                |
| 3150.0                                 | 62.9                     |               | 62.4                     |               | 63.1                     |               | 63.1                     |                | 62.5                     |                | 62.2                     |                |
| 4000.0                                 | 62.2                     |               | 62.2                     |               | 62.8                     |               | 62.7                     |                | 62.5                     |                | 61.8                     |                |
| 5000.0                                 | 60.9                     |               | 61.6                     |               | 62.7                     |               | 62.2                     |                | 62.2                     |                | 61.5                     |                |
| 6300.0                                 | 61.0                     |               | 62.2                     |               | 62.8                     |               | 62.4                     |                | 62.2                     |                | 61.9                     |                |
| 8000.0                                 | 61.0                     |               | 62.5                     |               | 61.5                     |               | 61.7                     |                | 61.5                     |                | 60.8                     |                |
| 10000.0                                | 61.5                     |               | 62.1                     |               | 61.7                     |               | 61.2                     |                | 60.9                     |                | 61.0                     |                |
| 12500.0                                | 61.9                     |               | 61.0                     |               | 62.2                     |               | 61.1                     |                | 60.7                     |                | 60.2                     |                |
| 16000.0                                | 60.7                     |               | 60.7                     |               | 61.0                     |               | 60.6                     |                | 60.0                     |                | 59.6                     |                |
| 20000.0                                | 59.3                     |               | 61.0                     |               | 61.5                     |               | 60.2                     |                | 59.5                     |                | 59.0                     |                |
| 25000.0                                | 59.0                     |               | 59.3                     |               | 60.7                     |               | 59.5                     |                | 58.4                     |                | 58.6                     |                |
| 31500.0                                | 58.8                     |               | 59.1                     |               | 60.1                     |               | 58.8                     |                | 57.3                     |                | 58.2                     |                |
| 40000.0                                | 57.2                     |               | 58.4                     |               | 59.3                     |               | 58.4                     |                | 56.0                     |                | 58.0                     |                |
| OVERALL<br>SPL                         | 77.0                     |               | 76.6                     |               | 76.9                     |               | 76.6                     |                | 76.1                     |                | 75.5                     |                |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE | MICRO<br>PHONE | MICRO<br>PHONE | MICRO<br>PHONE |
|-------------------------|----------------|----------------|----------------|----------------|
| FREQ.<br>HZ             | NO. ANGLE      | NO. ANGLE      | NO. ANGLE      | NO. ANGLE      |
|                         | 16 127.5       | 17 135.0       | 18 142.5       | 19 150.0       |
| 200.0                   | 57.3           | 58.3           | 58.3           | 59.6           |
| 250.0                   | 60.5           | 60.1           | 59.2           | 59.2           |
| 315.2                   | 62.6           | 61.6           | 60.2           | 60.4           |
| 400.0                   | 63.0           | 62.5           | 63.6           | 61.8           |
| 500.0                   | 63.2           | 63.0           | 63.0           | 61.9           |
| 630.0                   | 63.7           | 63.0           | 63.0           | 62.0           |
| 800.0                   | 64.2           | 63.7           | 62.3           | 62.4           |
| 1000.0                  | 64.3           | 63.7           | 62.6           | 61.8           |
| 1250.0                  | 63.6           | 62.4           | 61.7           | 59.7           |
| 1600.0                  | 62.1           | 61.0           | 60.0           | 58.2           |
| 2000.0                  | 62.1           | 60.8           | 59.4           | 57.1           |
| 2500.0                  | 61.7           | 60.3           | 58.5           | 56.3           |
| 3150.0                  | 61.3           | 60.3           | 58.2           | 55.5           |
| 4000.0                  | 61.5           | 59.8           | 57.9           | 54.1           |
| 5000.0                  | 60.9           | 58.9           | 56.7           | 52.5           |
| 6300.0                  | 60.8           | 59.2           | 56.4           | 51.8           |
| 8000.0                  | 60.1           | 58.4           | 54.9           | 49.7           |
| 10000.0                 | 60.2           | 58.2           | 54.9           | 47.8           |
| 12500.0                 | 59.4           | 56.8           | 52.4           | 46.4           |
| 16000.0                 | 58.7           | 55.9           | 51.4           | 45.3           |
| 20000.0                 | 58.3           | 54.7           | 51.1           | 46.7           |
| 25000.0                 | 57.2           | 53.2           | 48.2           | 42.3           |
| 31500.0                 | 56.0           | 51.9           | 46.7           | 42.1           |
| 40000.0                 | 55.2           | 51.3           | 45.9           | 45.1           |
| OVERALL<br>SPL          | 75.2           | 74.1           | 73.0           | 71.6           |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.71 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1480.00 DEG.F, CHAMBER TEMPERATURE = 114.00 DEG.F  
RELATIVE HUMIDITY = 24.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 100

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.050$   
TEMPERATURE RATIO  $TR = 3.380$   
MACH NUMBER  $MJ = 0.272$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 3.339$   
JET DENSITY RATIO  $DJ/D0 = 0.299$   
JET VELOCITY RATIO  $VJ/A0 = 0.496$   
JET VELOCITY  $VJ = 582.6$  FPS

$TR/TJ = 1.012$   
 $DR/D0 = 0.311$   
 $DR/DJ = 1.037$   
MASS FLOW = 0.272 POUNDS PER SECOND  
THRUST = 4.75 POUNDS

SHOCK CELL LENGTH  $S = 0.006$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>Hz | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 69.8                                  | 69.6                                  | 68.2                                  | 67.3                                  | 66.3                                  | 64.9                                  |
| 250.0                                  | 71.8                                  | 73.1                                  | 72.3                                  | 70.6                                  | 68.8                                  | 67.2                                  |
| 315.2                                  | 75.7                                  | 75.0                                  | 75.6                                  | 73.4                                  | 71.2                                  | 70.0                                  |
| 400.0                                  | 77.8                                  | 78.9                                  | 77.1                                  | 75.5                                  | 74.5                                  | 72.5                                  |
| 500.0                                  | 79.6                                  | 78.6                                  | 78.6                                  | 76.9                                  | 75.6                                  | 73.4                                  |
| 630.0                                  | 76.8                                  | 79.0                                  | 79.6                                  | 77.6                                  | 76.3                                  | 74.4                                  |
| 800.0                                  | 77.8                                  | -20.0                                 | 79.4                                  | 77.8                                  | 76.6                                  | 74.8                                  |
| 1000.0                                 | 74.1                                  | 76.5                                  | 78.9                                  | 77.8                                  | 77.0                                  | 75.7                                  |
| 1250.0                                 | 72.7                                  | 75.8                                  | 77.9                                  | 77.2                                  | 76.8                                  | 76.0                                  |
| 1600.0                                 | 69.4                                  | 73.2                                  | 75.5                                  | 75.8                                  | 75.4                                  | 75.0                                  |
| 2000.0                                 | 66.5                                  | 70.8                                  | 73.4                                  | 74.8                                  | 75.0                                  | 74.6                                  |
| 2500.0                                 | 63.2                                  | 67.9                                  | 71.0                                  | 72.9                                  | 73.6                                  | 73.7                                  |
| 3150.0                                 | 60.1                                  | 65.4                                  | 68.7                                  | 71.4                                  | 72.3                                  | 72.9                                  |
| 4000.0                                 | 59.6                                  | 64.0                                  | 66.2                                  | 69.3                                  | 71.0                                  | 72.1                                  |
| 5000.0                                 | 59.2                                  | 62.9                                  | 64.5                                  | 67.3                                  | 69.1                                  | 70.5                                  |
| 6300.0                                 | 57.4                                  | 61.6                                  | 61.8                                  | 64.7                                  | 66.6                                  | 70.1                                  |
| 8000.0                                 | 57.5                                  | 60.2                                  | 61.3                                  | 64.2                                  | 66.4                                  | 68.5                                  |
| 10000.0                                | 56.0                                  | 58.1                                  | 60.1                                  | 62.9                                  | 65.2                                  | 67.2                                  |
| 12500.0                                | 54.5                                  | 57.4                                  | 59.2                                  | 62.1                                  | 64.5                                  | 66.3                                  |
| 16000.0                                | 53.0                                  | 57.1                                  | 58.2                                  | 61.2                                  | 63.7                                  | 65.5                                  |
| 20000.0                                | 50.9                                  | 55.8                                  | 56.8                                  | 59.6                                  | 62.4                                  | 64.4                                  |
| 25000.0                                | 48.9                                  | 54.5                                  | 55.3                                  | 58.7                                  | 61.7                                  | 64.3                                  |
| 31500.0                                | 47.9                                  | 52.1                                  | 52.8                                  | 57.0                                  | 59.9                                  | 61.5                                  |
| 40000.0                                | 49.6                                  | 51.0                                  | 51.9                                  | 56.7                                  | 58.3                                  | 62.0                                  |
| OVERALL<br>SPL                         | 85.9                                  | 86.3                                  | 87.7                                  | 86.8                                  | 86.3                                  | 85.6                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 63.6                | 63.2                | 62.8                | 63.6                 | 63.0                 | 63.2                 |
| 250.0                   | 66.1                | 64.5                | 62.9                | 62.9                 | 63.3                 | 63.2                 |
| 315.2                   | 67.5                | 65.6                | 64.9                | 65.4                 | 64.2                 | 64.8                 |
| 400.0                   | 70.5                | 67.8                | 67.1                | 66.4                 | 65.4                 | 65.0                 |
| 500.0                   | 71.8                | 69.0                | 68.7                | 68.3                 | 67.6                 | 66.5                 |
| 630.0                   | 73.0                | 71.2                | 70.1                | 69.6                 | 68.6                 | 68.0                 |
| 800.0                   | 73.8                | 71.7                | 70.8                | 70.2                 | 69.0                 | 68.3                 |
| 1000.0                  | 74.1                | 72.2                | 71.8                | 70.9                 | 69.7                 | 69.2                 |
| 1250.0                  | 74.9                | 72.9                | 72.2                | 71.3                 | 70.4                 | 69.9                 |
| 1600.0                  | 74.3                | 72.3                | 71.8                | 70.7                 | 70.2                 | 69.3                 |
| 2000.0                  | 73.9                | 72.4                | 71.9                | 70.8                 | 70.3                 | 69.5                 |
| 2500.0                  | 73.1                | 71.7                | 71.2                | 70.7                 | 69.9                 | 69.2                 |
| 3150.0                  | 72.7                | 71.6                | 71.0                | 70.6                 | 69.8                 | 69.0                 |
| 4000.0                  | 72.2                | 71.6                | 70.2                | 69.9                 | 69.1                 | 68.8                 |
| 5000.0                  | 71.1                | 70.7                | 69.7                | 69.3                 | 68.5                 | 68.5                 |
| 6300.0                  | 71.0                | 70.0                | 69.7                | 69.6                 | 68.7                 | 68.3                 |
| 8000.0                  | 69.9                | 69.6                | 68.6                | 69.0                 | 68.0                 | 68.2                 |
| 10000.0                 | 69.2                | 68.8                | 68.0                | 68.3                 | 67.6                 | 68.0                 |
| 12500.0                 | 68.6                | 68.4                | 67.7                | 67.9                 | 67.4                 | 68.1                 |
| 16000.0                 | 68.0                | 68.2                | 67.9                | 67.1                 | 67.2                 | 67.9                 |
| 20000.0                 | 67.2                | 67.3                | 67.1                | 65.8                 | 66.2                 | 67.1                 |
| 25000.0                 | 66.4                | 66.2                | 66.6                | 64.7                 | 65.4                 | 66.1                 |
| 31500.0                 | 64.4                | 64.1                | 64.8                | 62.5                 | 63.5                 | 64.1                 |
| 40000.0                 | 62.6                | 62.5                | 62.7                | 60.4                 | 62.0                 | 62.1                 |
| OVERALL<br>SPL          | 85.0                | 83.6                | 83.0                | 82.4                 | 81.7                 | 81.5                 |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 0.71 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1342.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 60.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 230

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.050$   
TEMPERATURE RATIO  $TR = 3.465$   
MACH NUMBER  $MJ = 0.272$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 3.424$   
JET DENSITY RATIO  $DJ/D_0 = 0.292$   
JET VELOCITY RATIO  $VJ/A_0 = 0.503$   
JET VELOCITY  $VJ = 562.3$  FPS

$TR/TJ = 1.012$   
 $DR/D_0 = 0.303$   
 $DR/DJ = 1.037$   
MASS FLOW = 0.269 POUNDS PER SECOND  
THRUST = 4.76 POUNDS

SHOCK CELL LENGTH 'S' = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 57.7                                   | 59.7                                   | 61.6                                   | 60.7                                    | 60.6                                    | 59.9                                    |
| 250.0                                  | 62.2                                   | 63.0                                   | 61.6                                   | 62.8                                    | 62.5                                    | 62.7                                    |
| 315.2                                  | 65.4                                   | 65.0                                   | 66.5                                   | 65.2                                    | 64.7                                    | 65.9                                    |
| 400.0                                  | 67.7                                   | 67.6                                   | 67.0                                   | 66.5                                    | 65.9                                    | 66.2                                    |
| 500.0                                  | 69.4                                   | 68.5                                   | 67.2                                   | 67.1                                    | 66.5                                    | 66.7                                    |
| 630.0                                  | 70.2                                   | 69.0                                   | 68.1                                   | 68.0                                    | 67.5                                    | 67.8                                    |
| 800.0                                  | 71.6                                   | 70.8                                   | 69.4                                   | 69.0                                    | 68.5                                    | 68.4                                    |
| 1000.0                                 | 72.1                                   | 70.9                                   | 70.2                                   | 69.7                                    | 69.0                                    | 68.6                                    |
| 1250.0                                 | 71.8                                   | 70.5                                   | 70.0                                   | 69.5                                    | 69.5                                    | 68.3                                    |
| 1600.0                                 | 71.2                                   | 70.7                                   | 69.5                                   | 69.0                                    | 68.9                                    | 67.6                                    |
| 2000.0                                 | 70.7                                   | 70.4                                   | 69.4                                   | 69.0                                    | 68.8                                    | 67.9                                    |
| 2500.0                                 | 69.9                                   | 69.6                                   | 68.6                                   | 68.4                                    | 68.3                                    | 67.4                                    |
| 3150.0                                 | 69.3                                   | 69.1                                   | 68.2                                   | 68.5                                    | 68.0                                    | 67.1                                    |
| 4000.0                                 | 68.8                                   | 68.3                                   | 68.1                                   | 67.9                                    | 68.1                                    | 66.8                                    |
| 5000.0                                 | 67.9                                   | 67.7                                   | 67.9                                   | 67.4                                    | 68.1                                    | 66.4                                    |
| 6300.0                                 | 67.8                                   | 68.3                                   | 67.8                                   | 67.7                                    | 68.2                                    | 67.0                                    |
| 8000.0                                 | 67.4                                   | 68.4                                   | 66.5                                   | 66.9                                    | 67.4                                    | 66.0                                    |
| 10000.0                                | 67.9                                   | 68.2                                   | 66.7                                   | 66.8                                    | 66.5                                    | 65.9                                    |
| 12500.0                                | 68.1                                   | 67.1                                   | 66.4                                   | 66.5                                    | 66.6                                    | 65.1                                    |
| 16000.0                                | 66.8                                   | 66.5                                   | 64.9                                   | 65.7                                    | 66.1                                    | 64.4                                    |
| 20000.0                                | 65.5                                   | 67.1                                   | 65.3                                   | 65.2                                    | 65.8                                    | 64.3                                    |
| 25000.0                                | 65.9                                   | 65.7                                   | 64.9                                   | 64.5                                    | 65.1                                    | 64.0                                    |
| 31500.0                                | 66.3                                   | 65.9                                   | 64.7                                   | 64.2                                    | 64.7                                    | 64.0                                    |
| 40000.0                                | 65.4                                   | 65.6                                   | 64.4                                   | 64.4                                    | 64.0                                    | 64.1                                    |
| OVERALL<br>SPL                         | 82.5                                   | 82.1                                   | 81.2                                   | 81.0                                    | 80.9                                    | 80.1                                    |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 60.2                                    | 60.4                                    | 61.0                                    | 61.0                                    |
| 250.0                                  | 63.8                                    | 62.5                                    | 63.0                                    | 62.0                                    |
| 315.2                                  | 65.6                                    | 65.0                                    | 64.0                                    | 63.4                                    |
| 400.0                                  | 66.1                                    | 65.7                                    | 65.3                                    | 64.9                                    |
| 500.0                                  | 66.7                                    | 66.0                                    | 65.8                                    | 64.9                                    |
| 630.0                                  | 68.4                                    | 66.6                                    | 65.8                                    | 65.7                                    |
| 800.0                                  | 68.8                                    | 68.0                                    | 66.1                                    | 65.8                                    |
| 1000.0                                 | 68.7                                    | 67.2                                    | 66.2                                    | 65.6                                    |
| 1250.0                                 | 68.5                                    | 67.6                                    | 65.0                                    | 64.3                                    |
| 1600.0                                 | 67.7                                    | 66.1                                    | 63.8                                    | 63.4                                    |
| 2000.0                                 | 67.7                                    | 66.5                                    | 64.5                                    | 62.4                                    |
| 2500.0                                 | 67.5                                    | 66.1                                    | 63.7                                    | 61.6                                    |
| 3150.0                                 | 67.1                                    | 66.1                                    | 62.8                                    | 61.1                                    |
| 4000.0                                 | 66.8                                    | 65.6                                    | 63.0                                    | 60.0                                    |
| 5000.0                                 | 66.2                                    | 64.4                                    | 61.7                                    | 58.5                                    |
| 6300.0                                 | 66.1                                    | 64.6                                    | 61.2                                    | 57.8                                    |
| 8000.0                                 | 65.3                                    | 63.9                                    | 59.9                                    | 56.0                                    |
| 10000.0                                | 64.9                                    | 63.5                                    | 58.9                                    | 55.1                                    |
| 12500.0                                | 64.0                                    | 62.0                                    | 57.7                                    | 53.0                                    |
| 16000.0                                | 63.4                                    | 60.9                                    | 56.6                                    | 51.7                                    |
| 20000.0                                | 62.9                                    | 59.8                                    | 55.7                                    | 51.1                                    |
| 25000.0                                | 62.0                                    | 58.6                                    | 54.0                                    | 49.0                                    |
| 31500.0                                | 61.6                                    | 57.8                                    | 52.9                                    | 47.9                                    |
| 40000.0                                | 61.3                                    | 57.5                                    | 52.2                                    | 48.0                                    |
| OVERALL<br>SPL                         | 79.9                                    | 78.6                                    | 76.6                                    | 75.5                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.02 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1445.00 DEG.F, CHAMBER TEMPERATURE = 117.00 DEG.F  
RELATIVE HUMIDITY = 24.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 101

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.072$   
TEMPERATURE RATIO  $TR = 3.302$   
MACH NUMBER  $MJ = 0.324$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 3.245$   
JET DENSITY RATIO  $DJ/D_0 = 0.308$   
JET VELOCITY RATIO  $VJ/A_0 = 0.584$   
JET VELOCITY  $VJ = 687.6$  FPS

$TR/TJ = 1.017$   
 $DR/D_0 = 0.325$   
 $DR/DJ = 1.053$   
MASS FLOW = 0.329 POUNDS PER SECOND  
THRUST = 6.77 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 73.9                                  | 73.3                                  | 72.2                                  | 71.5                                  | 69.8                                  | 68.4                                  |
| 250.0                                  | 76.5                                  | 77.0                                  | 77.1                                  | 76.1                                  | 74.1                                  | 71.5                                  |
| 315.2                                  | 79.5                                  | 79.3                                  | 80.4                                  | 78.7                                  | 76.1                                  | 74.3                                  |
| 400.0                                  | 82.0                                  | 83.1                                  | 81.3                                  | 80.4                                  | 78.4                                  | 76.4                                  |
| 500.0                                  | 83.8                                  | 83.5                                  | 82.7                                  | 82.2                                  | 80.1                                  | 77.2                                  |
| 630.0                                  | 81.9                                  | 84.1                                  | 84.5                                  | 84.1                                  | 82.2                                  | 80.0                                  |
| 800.0                                  | 84.1                                  | 85.8                                  | 85.1                                  | 84.8                                  | 83.5                                  | 81.2                                  |
| 1000.0                                 | 80.9                                  | 83.5                                  | 84.9                                  | 84.4                                  | 82.8                                  | 80.8                                  |
| 1250.0                                 | 79.2                                  | 82.5                                  | 84.2                                  | 84.2                                  | 83.1                                  | 81.0                                  |
| 1600.0                                 | 75.8                                  | 79.3                                  | 81.3                                  | 82.5                                  | 82.0                                  | 80.7                                  |
| 2000.0                                 | 73.0                                  | 77.0                                  | 79.4                                  | 81.2                                  | 81.1                                  | 80.4                                  |
| 2500.0                                 | 69.6                                  | 74.8                                  | 77.1                                  | 79.5                                  | 79.7                                  | 79.5                                  |
| 3150.0                                 | 66.6                                  | 72.1                                  | 74.7                                  | 77.6                                  | 78.2                                  | 78.8                                  |
| 4000.0                                 | 65.2                                  | 70.3                                  | 72.0                                  | 75.5                                  | 76.9                                  | 77.7                                  |
| 5000.0                                 | 64.0                                  | 68.5                                  | 69.6                                  | 73.2                                  | 75.2                                  | 75.7                                  |
| 6300.0                                 | 60.2                                  | 66.8                                  | 67.6                                  | 71.7                                  | 73.2                                  | 74.4                                  |
| 8000.0                                 | 61.6                                  | 65.2                                  | 65.5                                  | 69.9                                  | 72.1                                  | 72.6                                  |
| 10000.0                                | 57.6                                  | 62.9                                  | 64.9                                  | 68.3                                  | 70.7                                  | 71.6                                  |
| 12500.0                                | 58.0                                  | 61.2                                  | 62.0                                  | 67.1                                  | 69.6                                  | 70.4                                  |
| 16000.0                                | 57.6                                  | 60.4                                  | 61.5                                  | 66.2                                  | 68.5                                  | 69.3                                  |
| 20000.0                                | 55.6                                  | 57.9                                  | 60.1                                  | 64.6                                  | 66.9                                  | 68.3                                  |
| 25000.0                                | 53.6                                  | 55.7                                  | 58.5                                  | 63.0                                  | 65.7                                  | 67.8                                  |
| 31500.0                                | 53.4                                  | 54.8                                  | 57.2                                  | 60.9                                  | 63.9                                  | 65.9                                  |
| 40000.0                                | 54.9                                  | 55.5                                  | 57.6                                  | 59.3                                  | 61.8                                  | 65.6                                  |
| OVERALL<br>SPL                         | 91.0                                  | 92.6                                  | 93.1                                  | 93.1                                  | 92.1                                  | 90.8                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 67.1                                  | 66.3                                  | 67.6                                  | 66.4                                   | 66.4                                   | 66.1                                   |
| 250.0                                  | 70.3                                  | 69.0                                  | 68.1                                  | 67.9                                   | 67.7                                   | 66.5                                   |
| 315.2                                  | 72.2                                  | 70.2                                  | 69.4                                  | 69.4                                   | 68.3                                   | 68.4                                   |
| 400.0                                  | 74.7                                  | 72.8                                  | 71.2                                  | 70.2                                   | 68.8                                   | 68.6                                   |
| 500.0                                  | 75.9                                  | 73.8                                  | 72.6                                  | 71.0                                   | 70.5                                   | 69.4                                   |
| 630.0                                  | 78.1                                  | 75.6                                  | 73.9                                  | 73.1                                   | 72.5                                   | 71.4                                   |
| 800.0                                  | 79.1                                  | 76.8                                  | 75.6                                  | 74.3                                   | 73.6                                   | 72.9                                   |
| 1000.0                                 | 79.7                                  | 77.6                                  | 76.5                                  | 75.5                                   | 74.4                                   | 73.5                                   |
| 1250.0                                 | 80.5                                  | 78.2                                  | 77.2                                  | 76.1                                   | 75.6                                   | 74.4                                   |
| 1600.0                                 | 80.0                                  | 77.9                                  | 77.2                                  | 75.9                                   | 75.5                                   | 74.2                                   |
| 2000.0                                 | 79.9                                  | 78.3                                  | 77.1                                  | 76.2                                   | 75.4                                   | 74.5                                   |
| 2500.0                                 | 79.6                                  | 77.8                                  | 76.7                                  | 76.3                                   | 75.6                                   | 74.5                                   |
| 3150.0                                 | 79.0                                  | 77.6                                  | 76.6                                  | 76.1                                   | 75.6                                   | 74.1                                   |
| 4000.0                                 | 78.5                                  | 77.4                                  | 75.8                                  | 75.9                                   | 74.8                                   | 74.0                                   |
| 5000.0                                 | 77.3                                  | 76.5                                  | 75.0                                  | 75.0                                   | 74.1                                   | 73.5                                   |
| 6300.0                                 | 76.1                                  | 75.3                                  | 73.8                                  | 74.4                                   | 73.7                                   | 73.1                                   |
| 8000.0                                 | 75.4                                  | 75.7                                  | 73.4                                  | 74.3                                   | 73.3                                   | 73.0                                   |
| 10000.0                                | 74.5                                  | 74.2                                  | 71.9                                  | 73.5                                   | 72.8                                   | 72.6                                   |
| 12500.0                                | 73.8                                  | 74.6                                  | 71.9                                  | 73.2                                   | 72.6                                   | 72.4                                   |
| 16000.0                                | 73.0                                  | 74.3                                  | 71.7                                  | 72.6                                   | 72.4                                   | 72.1                                   |
| 20000.0                                | 71.9                                  | 73.3                                  | 70.7                                  | 71.6                                   | 71.4                                   | 71.2                                   |
| 25000.0                                | 71.2                                  | 72.4                                  | 69.9                                  | 70.4                                   | 70.6                                   | 70.2                                   |
| 31500.0                                | 69.7                                  | 70.8                                  | 68.2                                  | 68.3                                   | 68.9                                   | 68.6                                   |
| 40000.0                                | 68.1                                  | 69.4                                  | 66.3                                  | 65.9                                   | 67.4                                   | 66.8                                   |
| OVERALL<br>SPL                         | 90.6                                  | 89.2                                  | 87.8                                  | 87.4                                   | 86.8                                   | 86.0                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.02 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1346.00 DEG.F, CHAMBER TEMPERATURE = 61.00 DEG.F  
RELATIVE HUMIDITY = 60.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 231

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.072$   
TEMPERATURE RATIO  $TR = 3.466$   
MACH NUMBER  $MJ = 0.325$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 3.407$   
JET DENSITY RATIO  $DJ/D_0 = 0.293$   
JET VELOCITY RATIO  $VJ/A_0 = 0.599$   
JET VELOCITY  $VJ = 670.4$  FPS

$TR/TJ = 1.017$   
 $DR/D_0 = 0.309$   
 $DR/DJ = 1.054$   
MASS FLOW = 0.322 POUNDS PER SECOND  
THRUST = 6.79 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 60.6                                   | 62.1                                   | 63.0                                   | 63.2                                    | 62.3                                    | 61.3                                    |
| 250.0                                  | 64.0                                   | 64.0                                   | 63.6                                   | 63.8                                    | 64.3                                    | 64.0                                    |
| 315.2                                  | 66.2                                   | 66.1                                   | 67.0                                   | 67.1                                    | 66.8                                    | 66.4                                    |
| 400.0                                  | 68.8                                   | 68.3                                   | 67.8                                   | 68.1                                    | 68.1                                    | 68.3                                    |
| 500.0                                  | 71.0                                   | 69.6                                   | 69.7                                   | 70.0                                    | 69.3                                    | 68.5                                    |
| 630.0                                  | 72.5                                   | 71.8                                   | 71.6                                   | 71.7                                    | 70.3                                    | 70.8                                    |
| 800.0                                  | 74.0                                   | 73.0                                   | 72.9                                   | 71.8                                    | 70.9                                    | 71.6                                    |
| 1000.0                                 | 74.9                                   | 73.2                                   | 73.2                                   | 72.7                                    | 71.7                                    | 71.3                                    |
| 1250.0                                 | 74.8                                   | 73.4                                   | 74.1                                   | 73.6                                    | 72.2                                    | 72.0                                    |
| 1600.0                                 | 74.4                                   | 73.6                                   | 73.6                                   | 73.0                                    | 71.9                                    | 71.6                                    |
| 2000.0                                 | 74.3                                   | 73.7                                   | 73.7                                   | 73.1                                    | 72.0                                    | 71.7                                    |
| 2500.0                                 | 73.6                                   | 73.0                                   | 73.0                                   | 72.6                                    | 72.0                                    | 71.6                                    |
| 3150.0                                 | 73.4                                   | 72.7                                   | 72.8                                   | 72.6                                    | 71.5                                    | 71.1                                    |
| 4000.0                                 | 72.8                                   | 72.5                                   | 72.8                                   | 72.0                                    | 71.2                                    | 70.7                                    |
| 5000.0                                 | 71.6                                   | 71.6                                   | 72.3                                   | 71.3                                    | 70.9                                    | 70.0                                    |
| 6300.0                                 | 71.4                                   | 71.9                                   | 72.4                                   | 71.3                                    | 71.2                                    | 70.3                                    |
| 8000.0                                 | 71.0                                   | 71.8                                   | 71.0                                   | 70.8                                    | 70.7                                    | 69.4                                    |
| 10000.0                                | 71.5                                   | 71.5                                   | 70.4                                   | 70.3                                    | 70.5                                    | 69.0                                    |
| 12500.0                                | 71.4                                   | 70.0                                   | 70.6                                   | 69.7                                    | 70.2                                    | 68.6                                    |
| 16000.0                                | 70.2                                   | 69.5                                   | 69.3                                   | 69.0                                    | 69.6                                    | 67.9                                    |
| 20000.0                                | 68.9                                   | 70.0                                   | 69.7                                   | 68.5                                    | 69.2                                    | 67.6                                    |
| 25000.0                                | 68.9                                   | 68.7                                   | 69.0                                   | 68.2                                    | 68.5                                    | 66.9                                    |
| 31500.0                                | 69.5                                   | 69.0                                   | 68.9                                   | 68.3                                    | 68.2                                    | 67.1                                    |
| 40000.0                                | 68.8                                   | 68.8                                   | 68.9                                   | 68.9                                    | 67.8                                    | 67.5                                    |
| OVERALL<br>SPL                         | 85.6                                   | 85.0                                   | 85.1                                   | 84.6                                    | 84.0                                    | 83.4                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 61.0  |       | 63.5  |       | 62.4  |       | 63.1  |  |
| 250.0   |       | 64.1  |       | 65.0  |       | 64.5  |       | 64.5  |  |
| 315.2   |       | 67.6  |       | 66.7  |       | 66.0  |       | 66.1  |  |
| 400.0   |       | 67.3  |       | 68.0  |       | 68.0  |       | 67.6  |  |
| 500.0   |       | 68.1  |       | 69.3  |       | 68.5  |       | 67.7  |  |
| 630.0   |       | 70.1  |       | 70.3  |       | 69.0  |       | 68.9  |  |
| 800.0   |       | 70.8  |       | 70.6  |       | 69.3  |       | 68.6  |  |
| 1000.0  |       | 70.9  |       | 71.7  |       | 70.1  |       | 68.8  |  |
| 1250.0  |       | 71.4  |       | 71.7  |       | 69.9  |       | 68.0  |  |
| 1600.0  |       | 71.2  |       | 70.7  |       | 69.0  |       | 67.0  |  |
| 2000.0  |       | 71.5  |       | 71.3  |       | 68.8  |       | 66.4  |  |
| 2500.0  |       | 71.0  |       | 70.7  |       | 68.0  |       | 65.7  |  |
| 3150.0  |       | 70.7  |       | 70.6  |       | 67.9  |       | 65.3  |  |
| 4000.0  |       | 70.5  |       | 70.2  |       | 67.2  |       | 64.5  |  |
| 5000.0  |       | 69.9  |       | 69.2  |       | 65.9  |       | 63.1  |  |
| 6300.0  |       | 69.6  |       | 69.0  |       | 65.4  |       | 62.7  |  |
| 8000.0  |       | 68.6  |       | 68.0  |       | 63.7  |       | 60.8  |  |
| 10000.0 |       | 68.2  |       | 67.0  |       | 63.0  |       | 60.0  |  |
| 12500.0 |       | 67.3  |       | 66.2  |       | 61.4  |       | 58.0  |  |
| 16000.0 |       | 66.6  |       | 64.8  |       | 60.4  |       | 56.3  |  |
| 20000.0 |       | 66.3  |       | 63.5  |       | 59.5  |       | 55.3  |  |
| 25000.0 |       | 65.1  |       | 62.6  |       | 58.4  |       | 53.7  |  |
| 31500.0 |       | 64.5  |       | 62.0  |       | 57.5  |       | 52.7  |  |
| 40000.0 |       | 64.2  |       | 61.9  |       | 56.6  |       | 52.3  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 82.7  |       | 82.5  |       | 80.4  |       | 78.9  |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.50 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1464.00 DEG.F, CHAMBER TEMPERATURE = 114.00 DEG.F  
RELATIVE HUMIDITY = 24.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 102

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.105  
TEMPERATURE RATIO TR = 3.352  
MACH NUMBER MJ = 0.391  
JET STATIC TEMPERATURE RATIO TJ/T0 = 3.270  
JET DENSITY RATIO DJ/D0 = 0.306  
JET VELOCITY RATIO VJ/A0 = 0.707  
JET VELOCITY VJ = 829.8 FPS

TR/TJ = 1.025  
DR/D0 = 0.330  
DR/DJ = 1.078  
MASS FLOW = 0.396 POUNDS PER SECOND  
THRUST = 9.84 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 77.4                                  | 75.8                                  | 75.3                                  | 73.3                                  | 74.1                                  | 70.8                                  |
| 250.0                                  | 79.3                                  | 79.2                                  | 80.2                                  | 76.9                                  | 74.9                                  | 73.5                                  |
| 315.2                                  | 83.1                                  | 82.5                                  | 82.6                                  | 80.1                                  | 78.3                                  | 77.0                                  |
| 400.0                                  | 85.6                                  | 86.4                                  | 84.4                                  | 82.4                                  | 81.9                                  | 79.5                                  |
| 500.0                                  | 88.1                                  | 86.9                                  | 86.8                                  | 84.7                                  | 82.9                                  | 81.2                                  |
| 630.0                                  | 86.6                                  | 88.5                                  | 89.3                                  | 87.7                                  | 85.6                                  | 83.4                                  |
| 800.0                                  | 89.9                                  | 91.0                                  | 91.0                                  | 89.0                                  | 87.4                                  | 85.5                                  |
| 1000.0                                 | 87.8                                  | 89.8                                  | 91.4                                  | 90.5                                  | 88.5                                  | 86.3                                  |
| 1250.0                                 | 86.2                                  | 89.0                                  | 90.3                                  | 90.0                                  | 88.9                                  | 86.8                                  |
| 1600.0                                 | 82.4                                  | 86.0                                  | 88.0                                  | 88.3                                  | 88.3                                  | 86.5                                  |
| 2000.0                                 | 79.4                                  | 83.7                                  | 85.7                                  | 87.0                                  | 87.3                                  | 86.3                                  |
| 2500.0                                 | 76.0                                  | 81.1                                  | 83.7                                  | 85.2                                  | 86.8                                  | 86.0                                  |
| 3150.0                                 | 72.8                                  | 78.4                                  | 81.4                                  | 83.3                                  | 85.6                                  | 85.1                                  |
| 4000.0                                 | 71.1                                  | 76.6                                  | 78.9                                  | 80.8                                  | 84.0                                  | 84.3                                  |
| 5000.0                                 | 69.2                                  | 74.9                                  | 76.8                                  | 78.7                                  | 82.4                                  | 82.7                                  |
| 6300.0                                 | 67.7                                  | 72.9                                  | 74.8                                  | 77.0                                  | 80.5                                  | 81.7                                  |
| 8000.0                                 | 67.3                                  | 71.4                                  | 72.7                                  | 75.0                                  | 78.9                                  | 80.1                                  |
| 10000.0                                | 65.9                                  | 68.7                                  | 70.6                                  | 73.1                                  | 77.4                                  | 78.7                                  |
| 12500.0                                | 64.5                                  | 67.9                                  | 68.9                                  | 71.7                                  | 75.5                                  | 77.5                                  |
| 16000.0                                | 63.1                                  | 67.4                                  | 67.7                                  | 70.4                                  | 74.4                                  | 76.6                                  |
| 20000.0                                | 59.9                                  | 64.9                                  | 65.9                                  | 68.3                                  | 72.9                                  | 75.3                                  |
| 25000.0                                | 57.3                                  | 63.3                                  | 64.5                                  | 67.0                                  | 71.5                                  | 74.6                                  |
| 31500.0                                | 55.9                                  | 58.7                                  | 62.6                                  | 64.9                                  | 69.5                                  | 73.0                                  |
| 40000.0                                | 56.5                                  | 57.6                                  | 57.6                                  | 64.4                                  | 67.7                                  | 72.1                                  |
| OVERALL<br>SPL                         | 96.2                                  | 97.7                                  | 98.6                                  | 97.9                                  | 97.6                                  | 96.4                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 71.0                                  | 69.9                                  | 68.4                                  | 68.1                                   | 67.6                                   | 67.8                                   |
| 250.0                                  | 73.9                                  | 71.0                                  | 69.5                                  | 68.9                                   | 69.3                                   | 68.8                                   |
| 315.2                                  | 73.7                                  | 72.1                                  | 70.5                                  | 71.0                                   | 70.1                                   | 70.4                                   |
| 400.0                                  | 77.4                                  | 74.3                                  | 72.9                                  | 72.4                                   | 71.5                                   | 71.2                                   |
| 500.0                                  | 78.6                                  | 76.3                                  | 74.5                                  | 73.6                                   | 73.3                                   | 72.1                                   |
| 630.0                                  | 80.8                                  | 78.4                                  | 77.3                                  | 76.4                                   | 75.6                                   | 74.6                                   |
| 800.0                                  | 82.7                                  | 80.7                                  | 78.7                                  | 78.1                                   | 76.9                                   | 76.2                                   |
| 1000.0                                 | 83.7                                  | 82.4                                  | 80.2                                  | 79.7                                   | 78.5                                   | 77.4                                   |
| 1250.0                                 | 84.8                                  | 83.3                                  | 81.3                                  | 80.5                                   | 79.6                                   | 78.7                                   |
| 1600.0                                 | 84.5                                  | 83.1                                  | 81.7                                  | 80.8                                   | 79.9                                   | 78.8                                   |
| 2000.0                                 | 84.4                                  | 83.6                                  | 82.3                                  | 81.0                                   | 80.0                                   | 79.0                                   |
| 2500.0                                 | 84.0                                  | 83.2                                  | 82.2                                  | 80.8                                   | 80.2                                   | 79.3                                   |
| 3150.0                                 | 83.2                                  | 83.1                                  | 82.2                                  | 80.9                                   | 80.4                                   | 79.3                                   |
| 4000.0                                 | 83.2                                  | 82.9                                  | 81.3                                  | 80.5                                   | 80.1                                   | 79.1                                   |
| 5000.0                                 | 82.0                                  | 82.0                                  | 80.7                                  | 79.9                                   | 79.7                                   | 78.5                                   |
| 6300.0                                 | 80.7                                  | 81.5                                  | 80.0                                  | 79.6                                   | 79.4                                   | 78.1                                   |
| 8000.0                                 | 79.8                                  | 81.0                                  | 79.4                                  | 79.2                                   | 78.9                                   | 77.7                                   |
| 10000.0                                | 78.8                                  | 80.1                                  | 79.1                                  | 78.4                                   | 77.5                                   | 77.4                                   |
| 12500.0                                | 77.5                                  | 79.5                                  | 78.1                                  | 77.9                                   | 77.7                                   | 76.6                                   |
| 16000.0                                | 76.4                                  | 79.0                                  | 77.9                                  | 77.3                                   | 77.5                                   | 76.3                                   |
| 20000.0                                | 75.0                                  | 77.7                                  | 77.0                                  | 76.3                                   | 76.4                                   | 74.9                                   |
| 25000.0                                | 73.5                                  | 76.9                                  | 76.3                                  | 75.2                                   | 75.6                                   | 73.8                                   |
| 31500.0                                | 71.5                                  | 75.4                                  | 74.8                                  | 73.4                                   | 73.9                                   | 72.1                                   |
| 40000.0                                | 70.0                                  | 74.1                                  | 73.3                                  | 71.3                                   | 72.5                                   | 70.3                                   |
| OVERALL<br>SPL                         | 94.6                                  | 94.1                                  | 92.7                                  | 91.9                                   | 91.4                                   | 90.3                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.40 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1354.00 DEG.F, CHAMBER TEMPERATURE = 61.00 DEG.F  
RELATIVE HUMIDITY = 60.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 232

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.099  
TEMPERATURE RATIO TR = 3.482  
MACH NUMBER M-J = 0.378  
JET STATIC TEMPERATURE RATIO TJ/T0 = 3.401  
JET DENSITY RATIO DJ/D0 = 0.294  
JET VELOCITY RATIO VJ/A0 = 0.698  
JET VELOCITY VJ = 781.0 FPS

TR/TJ = 1.024  
PR/D0 = 0.316  
DR/CJ = 1.073  
MASS FLOW = 0.376 POUNDS PER SECOND  
THRUST = 9.23 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 61.9                                   | 64.1                                   | 65.5                                   | 65.4                                    | 63.8                                    | 63.2                                    |
| 250.0                                  | 64.7                                   | 66.1                                   | 66.2                                   | 65.7                                    | 66.6                                    | 66.4                                    |
| 315.2                                  | 68.1                                   | 68.6                                   | 68.9                                   | 68.7                                    | 69.0                                    | 69.0                                    |
| 400.0                                  | 70.2                                   | 70.1                                   | 70.7                                   | 70.3                                    | 69.9                                    | 70.3                                    |
| 500.0                                  | 72.6                                   | 72.7                                   | 72.5                                   | 72.4                                    | 71.8                                    | 71.2                                    |
| 630.0                                  | 75.3                                   | 74.3                                   | 73.2                                   | 73.9                                    | 73.5                                    | 73.4                                    |
| 800.0                                  | 76.6                                   | 76.6                                   | 74.6                                   | 74.8                                    | 74.6                                    | 74.3                                    |
| 1000.0                                 | 77.9                                   | 76.6                                   | 76.0                                   | 75.8                                    | 75.0                                    | 74.8                                    |
| 1250.0                                 | 78.4                                   | 77.4                                   | 77.1                                   | 76.8                                    | 76.1                                    | 75.5                                    |
| 1600.0                                 | 78.2                                   | 77.4                                   | 76.8                                   | 76.6                                    | 75.9                                    | 75.4                                    |
| 2000.0                                 | 78.3                                   | 78.3                                   | 77.5                                   | 77.2                                    | 76.5                                    | 75.8                                    |
| 2500.0                                 | 78.0                                   | 77.8                                   | 77.0                                   | 77.1                                    | 76.3                                    | 75.6                                    |
| 3150.0                                 | 78.0                                   | 77.7                                   | 76.7                                   | 76.9                                    | 76.1                                    | 75.5                                    |
| 4000.0                                 | 77.4                                   | 77.7                                   | 76.4                                   | 76.6                                    | 75.7                                    | 74.9                                    |
| 5000.0                                 | 76.3                                   | 76.6                                   | 76.3                                   | 75.9                                    | 75.5                                    | 74.2                                    |
| 6300.0                                 | 75.9                                   | 76.8                                   | 75.9                                   | 76.1                                    | 75.8                                    | 74.4                                    |
| 8000.0                                 | 75.6                                   | 76.7                                   | 74.6                                   | 75.0                                    | 74.9                                    | 73.3                                    |
| 10000.0                                | 76.1                                   | 76.1                                   | 74.3                                   | 74.7                                    | 74.5                                    | 72.3                                    |
| 12500.0                                | 75.7                                   | 74.9                                   | 74.3                                   | 74.6                                    | 74.1                                    | 72.2                                    |
| 16000.0                                | 74.2                                   | 74.2                                   | 72.9                                   | 73.8                                    | 73.5                                    | 71.1                                    |
| 20000.0                                | 72.6                                   | 74.6                                   | 73.0                                   | 73.2                                    | 73.0                                    | 70.6                                    |
| 25000.0                                | 73.1                                   | 73.6                                   | 72.7                                   | 72.8                                    | 72.7                                    | 70.2                                    |
| 31500.0                                | 73.6                                   | 74.0                                   | 72.9                                   | 72.6                                    | 72.7                                    | 70.3                                    |
| 40000.0                                | 73.1                                   | 74.2                                   | 73.2                                   | 73.3                                    | 72.4                                    | 70.8                                    |
| OVERALL<br>SPL                         | 89.4                                   | 89.3                                   | 88.4                                   | 88.5                                    | 87.9                                    | 86.9                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 62.7                        | 62.8                        | 64.2                        | 64.9                        |
| 250.0                                  | 66.4                        | 65.9                        | 67.1                        | 66.1                        |
| 315.2                                  | 69.0                        | 67.8                        | 68.3                        | 67.1                        |
| 400.0                                  | 69.2                        | 68.9                        | 68.4                        | 68.8                        |
| 500.0                                  | 71.4                        | 71.0                        | 69.6                        | 70.1                        |
| 630.0                                  | 73.3                        | 72.4                        | 70.9                        | 70.7                        |
| 800.0                                  | 73.8                        | 73.5                        | 71.8                        | 71.4                        |
| 1000.0                                 | 74.3                        | 73.3                        | 72.6                        | 71.6                        |
| 1250.0                                 | 74.6                        | 73.8                        | 73.2                        | 71.0                        |
| 1600.0                                 | 74.4                        | 73.6                        | 72.4                        | 70.8                        |
| 2000.0                                 | 75.1                        | 74.0                        | 72.6                        | 70.3                        |
| 2500.0                                 | 75.0                        | 73.6                        | 72.5                        | 69.9                        |
| 3150.0                                 | 75.0                        | 73.9                        | 72.3                        | 69.8                        |
| 4000.0                                 | 74.6                        | 73.8                        | 72.3                        | 69.3                        |
| 5000.0                                 | 73.9                        | 72.6                        | 71.1                        | 68.0                        |
| 6300.0                                 | 73.9                        | 72.4                        | 70.7                        | 67.7                        |
| 8000.0                                 | 72.8                        | 71.3                        | 69.4                        | 66.1                        |
| 10000.0                                | 72.1                        | 70.1                        | 67.9                        | 64.7                        |
| 12500.0                                | 71.1                        | 68.9                        | 66.9                        | 63.1                        |
| 16000.0                                | 70.3                        | 67.7                        | 65.9                        | 61.5                        |
| 20000.0                                | 69.5                        | 66.5                        | 65.2                        | 61.1                        |
| 25000.0                                | 68.6                        | 65.1                        | 63.7                        | 59.1                        |
| 31500.0                                | 68.2                        | 64.4                        | 62.7                        | 58.1                        |
| 40000.0                                | 68.1                        | 64.5                        | 62.0                        | 58.0                        |
| OVERALL<br>SPL                         | 86.3                        | 85.1                        | 83.8                        | 82.0                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.90 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1520.00 DEG.F, CHAMBER TEMPERATURE = 115.00 DEG.F  
RELATIVE HUMIDITY = 26.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 103

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.134  
TEMPERATURE RATIO TR = 3.443  
MACH NUMBER MJ = 0.438  
JET STATIC TEMPERATURE RATIO TJ/TO = 3.338  
JET DENSITY RATIO DJ/DO = 0.300  
JET VELOCITY RATIO VJ/A0 = 0.800  
JET VELOCITY VJ = 939.9 FPS

TR/TJ = 1.032  
DR/DO = 0.329  
DR/DJ = 1.099  
MASS FLOW = 0.439 POUNDS PER SECOND  
THRUST = 12.35 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 79.4                                  | 77.4                                  | 77.0                                  | 75.8                                  | 75.0                                  | 72.3                                  |
| 250.0                                  | 81.9                                  | 81.0                                  | 81.3                                  | 79.5                                  | 77.6                                  | 74.9                                  |
| 315.2                                  | 84.8                                  | 83.9                                  | 85.0                                  | 82.2                                  | 80.1                                  | 78.1                                  |
| 400.0                                  | 87.7                                  | 88.6                                  | 86.6                                  | 85.0                                  | 83.3                                  | 81.0                                  |
| 500.0                                  | 90.1                                  | 89.3                                  | 89.4                                  | 87.9                                  | 85.6                                  | 82.7                                  |
| 630.0                                  | 89.0                                  | 90.9                                  | 91.4                                  | 90.0                                  | 88.4                                  | 85.0                                  |
| 800.0                                  | 93.0                                  | 94.1                                  | 93.3                                  | 92.2                                  | 90.3                                  | 87.0                                  |
| 1000.0                                 | 91.5                                  | 93.7                                  | 94.4                                  | 93.9                                  | 91.7                                  | 88.8                                  |
| 1250.0                                 | 91.2                                  | 93.4                                  | 95.0                                  | 94.3                                  | 92.6                                  | 89.4                                  |
| 1600.0                                 | 88.3                                  | 90.7                                  | 92.3                                  | 92.3                                  | 91.7                                  | 89.0                                  |
| 2000.0                                 | 84.8                                  | 88.0                                  | 90.1                                  | 90.8                                  | 91.5                                  | 89.0                                  |
| 2500.0                                 | 81.4                                  | 85.1                                  | 87.5                                  | 89.1                                  | 90.2                                  | 88.5                                  |
| 3150.0                                 | 78.1                                  | 82.5                                  | 85.1                                  | 87.0                                  | 89.0                                  | 87.8                                  |
| 4000.0                                 | 76.2                                  | 80.4                                  | 82.9                                  | 85.1                                  | 87.8                                  | 86.9                                  |
| 5000.0                                 | 73.8                                  | 78.6                                  | 81.0                                  | 83.1                                  | 86.1                                  | 85.6                                  |
| 6300.0                                 | 71.9                                  | 76.3                                  | 79.0                                  | 81.2                                  | 84.4                                  | 84.2                                  |
| 8000.0                                 | 70.8                                  | 74.7                                  | 77.2                                  | 79.6                                  | 82.8                                  | 82.7                                  |
| 10000.0                                | 70.0                                  | 72.3                                  | 75.6                                  | 77.8                                  | 81.2                                  | 81.4                                  |
| 12500.0                                | 67.2                                  | 71.2                                  | 74.0                                  | 76.6                                  | 79.9                                  | 80.1                                  |
| 16000.0                                | 65.5                                  | 70.3                                  | 72.9                                  | 75.4                                  | 78.7                                  | 79.1                                  |
| 20000.0                                | 62.1                                  | 68.1                                  | 71.5                                  | 73.8                                  | 77.0                                  | 77.7                                  |
| 25000.0                                | -8.8                                  | 66.2                                  | 70.2                                  | 72.2                                  | 75.5                                  | 76.8                                  |
| 31500.0                                | -8.7                                  | 64.0                                  | 68.0                                  | 69.9                                  | 73.1                                  | 75.1                                  |
| 40000.0                                | -7.6                                  | -7.6                                  | 66.1                                  | 68.5                                  | 70.8                                  | 74.0                                  |
| OVERALL<br>SPL                         | 99.5                                  | 101.1                                 | 101.9                                 | 101.5                                 | 101.0                                 | 98.8                                  |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 70.4                                  | 68.7                                  | 69.5                                  | 69.6                                   | 68.4                                   | 69.5                                   |
| 250.0                                  | 72.8                                  | 71.0                                  | 69.5                                  | 70.2                                   | 69.7                                   | 70.7                                   |
| 315.2                                  | 74.8                                  | 73.4                                  | 71.5                                  | 72.2                                   | 70.5                                   | 71.4                                   |
| 400.0                                  | 78.1                                  | 75.5                                  | 74.4                                  | 73.6                                   | 73.1                                   | 72.2                                   |
| 500.0                                  | 80.3                                  | 77.5                                  | 76.3                                  | 75.2                                   | 74.7                                   | 73.4                                   |
| 630.0                                  | 82.4                                  | 79.8                                  | 78.2                                  | 77.5                                   | 76.6                                   | 76.1                                   |
| 800.0                                  | 84.7                                  | 81.8                                  | 80.5                                  | 79.6                                   | 78.2                                   | 77.9                                   |
| 1000.0                                 | 86.2                                  | 83.5                                  | 81.9                                  | 81.4                                   | 79.8                                   | 79.6                                   |
| 1250.0                                 | 87.6                                  | 85.3                                  | 83.3                                  | 82.5                                   | 81.3                                   | 80.2                                   |
| 1600.0                                 | 87.7                                  | 85.1                                  | 83.6                                  | 83.0                                   | 81.4                                   | 80.6                                   |
| 2000.0                                 | 87.9                                  | 86.0                                  | 84.5                                  | 83.8                                   | 82.0                                   | 81.0                                   |
| 2500.0                                 | 87.5                                  | 86.0                                  | 84.8                                  | 83.9                                   | 82.3                                   | 81.1                                   |
| 3150.0                                 | 87.3                                  | 86.2                                  | 84.9                                  | 84.1                                   | 82.3                                   | 81.3                                   |
| 4000.0                                 | 87.0                                  | 85.9                                  | 84.8                                  | 83.8                                   | 82.2                                   | 81.1                                   |
| 5000.0                                 | 85.8                                  | 85.4                                  | 84.2                                  | 83.1                                   | 81.6                                   | 80.7                                   |
| 6300.0                                 | 85.0                                  | 84.9                                  | 83.7                                  | 82.5                                   | 80.9                                   | 80.6                                   |
| 8000.0                                 | 83.9                                  | 84.2                                  | 82.8                                  | 81.9                                   | 80.5                                   | 80.4                                   |
| 10000.0                                | 82.8                                  | 83.2                                  | 82.1                                  | 80.7                                   | 79.6                                   | 79.6                                   |
| 12500.0                                | 81.5                                  | 82.5                                  | 81.5                                  | 80.1                                   | 78.6                                   | 79.4                                   |
| 16000.0                                | 80.5                                  | 81.9                                  | 81.2                                  | 79.5                                   | 78.3                                   | 78.9                                   |
| 20000.0                                | 79.2                                  | 80.6                                  | 80.2                                  | 78.3                                   | 76.8                                   | 77.7                                   |
| 25000.0                                | 78.1                                  | 79.4                                  | 79.3                                  | 77.0                                   | 75.7                                   | 76.4                                   |
| 31500.0                                | 76.3                                  | 77.7                                  | 77.7                                  | 74.9                                   | 73.9                                   | 74.5                                   |
| 40000.0                                | 74.8                                  | 76.5                                  | 76.2                                  | 72.6                                   | 72.6                                   | 72.8                                   |
| OVERALL<br>SPL                         | 97.9                                  | 96.7                                  | 95.4                                  | 94.4                                   | 92.9                                   | 92.4                                   |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 1.86 PSI, ATMOSPHERIC PRESSURE = 14.18 PSI  
RESERVOIR TEMPERATURE = 1366.00 DEG.F, CHAMBER TEMPERATURE = 61.00 DEG.F  
RELATIVE HUMIDITY = 60.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 233

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.131$   
TEMPERATURE RATIO  $TR = 3.505$   
MACH NUMBER  $MJ = 0.434$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 3.399$   
JET DENSITY RATIO  $DJ/DO = 0.294$   
JET VELOCITY RATIO  $VJ/AO = 0.800$   
JET VELOCITY  $VJ = 894.9$  FPS

$TR/TJ = 1.031$   
 $DR/DO = 0.323$   
 $DR/DJ = 1.097$   
MASS FLOW = 0.431 POUNDS PER SECOND  
THRUST = 12.13 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 64.6                                   | 66.2                                   | 67.8                                   | 66.5                                    | 68.2                                    | 66.8                                    |
| 250.0                                  | 67.3                                   | 68.3                                   | 68.7                                   | 67.4                                    | 67.8                                    | 68.5                                    |
| 315.2                                  | 71.5                                   | 71.4                                   | 72.3                                   | 71.7                                    | 72.0                                    | 72.1                                    |
| 400.0                                  | 71.5                                   | 72.2                                   | 72.5                                   | 72.4                                    | 72.2                                    | 71.9                                    |
| 500.0                                  | 74.7                                   | 74.2                                   | 74.2                                   | 74.6                                    | 74.2                                    | 73.7                                    |
| 630.0                                  | 76.7                                   | 75.7                                   | 76.1                                   | 75.9                                    | 75.5                                    | 75.6                                    |
| 800.0                                  | 79.3                                   | 78.0                                   | 78.2                                   | 77.9                                    | 77.5                                    | 76.9                                    |
| 1000.0                                 | 81.0                                   | 80.3                                   | 79.2                                   | 79.4                                    | 79.0                                    | 78.4                                    |
| 1250.0                                 | 82.6                                   | 80.8                                   | 80.3                                   | 80.2                                    | 79.6                                    | 78.4                                    |
| 1600.0                                 | 83.1                                   | 81.2                                   | 81.6                                   | 80.7                                    | 80.4                                    | 79.4                                    |
| 2000.0                                 | 83.4                                   | 82.1                                   | 81.6                                   | 81.5                                    | 80.8                                    | 79.9                                    |
| 2500.0                                 | 82.9                                   | 82.4                                   | 81.9                                   | 81.4                                    | 80.8                                    | 80.2                                    |
| 3150.0                                 | 83.2                                   | 82.6                                   | 81.9                                   | 81.7                                    | 80.8                                    | 80.2                                    |
| 4000.0                                 | 83.2                                   | 82.2                                   | 81.9                                   | 81.5                                    | 80.7                                    | 79.8                                    |
| 5000.0                                 | 82.3                                   | 81.4                                   | 81.5                                   | 80.9                                    | 80.0                                    | 79.7                                    |
| 6300.0                                 | 81.8                                   | 81.4                                   | 81.6                                   | 80.8                                    | 80.3                                    | 79.5                                    |
| 8000.0                                 | 80.8                                   | 80.9                                   | 80.6                                   | 80.1                                    | 79.5                                    | 78.7                                    |
| 10000.0                                | 81.0                                   | 81.0                                   | 79.7                                   | 79.9                                    | 79.8                                    | 78.9                                    |
| 12500.0                                | 81.3                                   | 80.5                                   | 79.6                                   | 79.4                                    | 79.0                                    | 78.3                                    |
| 16000.0                                | 80.4                                   | 78.8                                   | 78.8                                   | 78.6                                    | 78.4                                    | 77.7                                    |
| 20000.0                                | 79.2                                   | 78.9                                   | 77.9                                   | 78.3                                    | 78.0                                    | 77.3                                    |
| 25000.0                                | 78.4                                   | 78.9                                   | 78.2                                   | 78.0                                    | 77.7                                    | 77.3                                    |
| 31500.0                                | 79.3                                   | 78.2                                   | 78.1                                   | 77.8                                    | 77.4                                    | 77.4                                    |
| 40000.0                                | 80.2                                   | 79.7                                   | 79.2                                   | 78.9                                    | 78.4                                    | 79.1                                    |
| OVERALL<br>SPL                         | 94.3                                   | 93.5                                   | 93.1                                   | 92.8                                    | 92.3                                    | 91.7                                    |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 66.1                                    | 65.5                                    | 64.2                                    | 65.8                                    |
| 250.0                                  | 67.7                                    | 66.8                                    | 67.6                                    | 68.8                                    |
| 315.2                                  | 73.1                                    | 71.3                                    | 71.0                                    | 71.7                                    |
| 400.0                                  | 72.6                                    | 71.0                                    | 71.3                                    | 70.9                                    |
| 500.0                                  | 72.7                                    | 72.7                                    | 73.0                                    | 72.1                                    |
| 630.0                                  | 75.6                                    | 73.7                                    | 73.5                                    | 73.4                                    |
| 800.0                                  | 77.2                                    | 76.1                                    | 74.4                                    | 74.0                                    |
| 1000.0                                 | 77.9                                    | 76.4                                    | 76.2                                    | 75.1                                    |
| 1250.0                                 | 78.1                                    | 76.7                                    | 76.4                                    | 75.2                                    |
| 1600.0                                 | 78.5                                    | 77.7                                    | 76.4                                    | 75.0                                    |
| 2000.0                                 | 79.5                                    | 78.0                                    | 76.8                                    | 75.0                                    |
| 2500.0                                 | 79.4                                    | 78.4                                    | 76.9                                    | 75.0                                    |
| 3150.0                                 | 79.6                                    | 78.7                                    | 76.9                                    | 74.7                                    |
| 4000.0                                 | 79.7                                    | 78.4                                    | 76.9                                    | 74.6                                    |
| 5000.0                                 | 79.4                                    | 77.6                                    | 76.3                                    | 73.4                                    |
| 6300.0                                 | 79.4                                    | 77.3                                    | 76.2                                    | 73.1                                    |
| 8000.0                                 | 78.4                                    | 76.5                                    | 74.9                                    | 72.1                                    |
| 10000.0                                | 77.9                                    | 75.3                                    | 73.8                                    | 70.6                                    |
| 12500.0                                | 77.2                                    | 74.2                                    | 72.3                                    | 69.4                                    |
| 16000.0                                | 76.4                                    | 73.0                                    | 71.1                                    | 67.8                                    |
| 20000.0                                | 76.0                                    | 72.1                                    | 70.3                                    | 66.5                                    |
| 25000.0                                | 75.5                                    | 71.2                                    | 69.4                                    | 65.2                                    |
| 31500.0                                | 75.2                                    | 70.5                                    | 68.5                                    | 63.9                                    |
| 40000.0                                | 75.9                                    | 71.2                                    | 69.1                                    | 64.2                                    |
| OVERALL<br>SPL                         | 91.0                                    | 89.2                                    | 88.0                                    | 86.2                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.40 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1540.00 DEG.F, CHAMBER TEMPERATURE = 116.00 DEG.F  
RELATIVE HUMIDITY = 22.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 104

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_R = 1.169$   
TEMPERATURE RATIO  $T_R = 3.472$   
MACH NUMBER  $M_J = 0.489$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 3.340$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.299$   
JET VELOCITY RATIO  $V_J/A_0 = 0.894$   
JET VELOCITY  $V_J = 1051.4$  FPS

$T_R/T_J = 1.039$   
 $\rho_R/\rho_0 = 0.337$   
 $\rho_R/\rho_J = 1.124$   
MASS FLOW = 0.450 POUNDS PER SECOND  
THRUST = 15.41 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 81.7  |       | 80.3  |       | 80.1  |       |
| 250.0   | 83.4  |       | 83.6  |       | 82.1  |       |
| 315.2   | 87.9  |       | 86.6  |       | 84.6  |       |
| 400.0   | 90.1  |       | 90.8  |       | 87.2  |       |
| 500.0   | 93.5  |       | 91.6  |       | 89.9  |       |
| 630.0   | 91.8  |       | 93.8  |       | 92.5  |       |
| 800.0   | 95.1  |       | 97.2  |       | 94.8  |       |
| 1000.0  | 93.8  |       | 97.1  |       | 97.0  |       |
| 1250.0  | 94.4  |       | 97.9  |       | 98.3  |       |
| 1600.0  | 92.5  |       | 96.4  |       | 96.8  |       |
| 2000.0  | 89.6  |       | 93.9  |       | 95.5  |       |
| 2500.0  | 85.4  |       | 90.7  |       | 93.4  |       |
| 3150.0  | 81.5  |       | 87.7  |       | 91.3  |       |
| 4000.0  | 79.1  |       | 85.7  |       | 89.1  |       |
| 5000.0  | 76.5  |       | 83.5  |       | 87.0  |       |
| 6300.0  | 74.1  |       | 81.4  |       | 85.2  |       |
| 8000.0  | 73.0  |       | 79.6  |       | 83.3  |       |
| 10000.0 | 71.6  |       | 77.3  |       | 81.1  |       |
| 12500.0 | 70.3  |       | 76.0  |       | 79.7  |       |
| 16000.0 | 69.0  |       | 74.4  |       | 78.2  |       |
| 20000.0 | 65.5  |       | 72.2  |       | 76.4  |       |
| 25000.0 | 63.0  |       | 70.2  |       | 74.9  |       |
| 31500.0 | -8.7  |       | 67.2  |       | 72.3  |       |
| 40000.0 | -7.6  |       | 64.7  |       | 70.6  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 102.4 |       | 105.0 |       | 105.1 |       |
|         |       |       |       |       | 104.6 |       |
|         |       |       |       |       |       | 102.6 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 72.4                                  | 71.4                                  | 61.0                                  | 71.6                                   | 70.8                                   | 70.8                                   |
| 250.0                                  | 74.8                                  | 72.5                                  | 71.9                                  | 71.8                                   | 71.4                                   | 71.2                                   |
| 315.2                                  | 77.0                                  | 74.0                                  | 73.2                                  | 73.9                                   | 72.7                                   | 73.2                                   |
| 400.0                                  | 80.1                                  | 77.0                                  | 75.6                                  | 75.0                                   | 73.8                                   | 74.0                                   |
| 500.0                                  | 81.8                                  | 79.0                                  | 78.3                                  | 77.0                                   | 76.6                                   | 76.1                                   |
| 630.0                                  | 84.5                                  | 81.5                                  | 80.7                                  | 79.0                                   | 78.6                                   | 77.8                                   |
| 800.0                                  | 87.0                                  | 84.2                                  | 82.3                                  | 81.0                                   | 80.5                                   | 80.5                                   |
| 1000.0                                 | 88.9                                  | 85.6                                  | 84.7                                  | 83.6                                   | 82.2                                   | 81.5                                   |
| 1250.0                                 | 90.5                                  | 87.3                                  | 86.5                                  | 84.8                                   | 84.2                                   | 83.0                                   |
| 1600.0                                 | 90.7                                  | 87.5                                  | 87.0                                  | 85.5                                   | 84.2                                   | 84.1                                   |
| 2000.0                                 | 91.4                                  | 88.7                                  | 87.9                                  | 86.6                                   | 85.1                                   | 84.3                                   |
| 2500.0                                 | 91.2                                  | 89.0                                  | 88.2                                  | 86.9                                   | 85.4                                   | 84.5                                   |
| 3150.0                                 | 91.0                                  | 89.0                                  | 88.6                                  | 87.3                                   | 85.8                                   | 85.1                                   |
| 4000.0                                 | 91.1                                  | 89.5                                  | 88.4                                  | 87.1                                   | 85.3                                   | 85.2                                   |
| 5000.0                                 | 90.4                                  | 88.7                                  | 87.8                                  | 86.5                                   | 85.0                                   | 84.9                                   |
| 6300.0                                 | 89.5                                  | 88.2                                  | 87.3                                  | 86.0                                   | 84.4                                   | 84.6                                   |
| 8000.0                                 | 88.4                                  | 87.5                                  | 86.7                                  | 85.8                                   | 83.8                                   | 84.2                                   |
| 10000.0                                | 87.1                                  | 86.4                                  | 85.7                                  | 84.5                                   | 83.3                                   | 83.7                                   |
| 12500.0                                | 85.7                                  | 85.7                                  | 85.1                                  | 83.9                                   | 82.7                                   | 83.3                                   |
| 16000.0                                | 84.5                                  | 84.9                                  | 84.6                                  | 82.7                                   | 82.3                                   | 82.6                                   |
| 20000.0                                | 83.0                                  | 83.5                                  | 83.5                                  | 81.5                                   | 81.1                                   | 81.3                                   |
| 25000.0                                | 81.7                                  | 82.4                                  | 82.7                                  | 80.1                                   | 80.0                                   | 80.0                                   |
| 31500.0                                | 79.6                                  | 80.5                                  | 81.0                                  | 77.9                                   | 78.2                                   | 78.1                                   |
| 40000.0                                | 77.8                                  | 79.0                                  | 79.2                                  | 75.8                                   | 76.9                                   | 76.3                                   |
| OVERALL<br>SPL                         | 101.4                                 | 99.5                                  | 98.8                                  | 97.4                                   | 96.2                                   | 95.9                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 2.36 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1376.00 DEG.F, CHAMBER TEMPERATURE = 61.00 DEG.F  
RELATIVE HUMIDITY = 40.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 176

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.168$   
TEMPERATURE RATIO  $TR = 3.524$   
MACH NUMBER  $MJ = 0.488$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 3.391$   
JET DENSITY RATIO  $DJ/D0 = 0.295$   
JET VELOCITY RATIO  $VJ/A0 = 0.899$   
JET VELOCITY  $VJ = 1006.2$  FPS

$TR/TJ = 1.039$   
 $DR/D0 = 0.332$   
 $DR/DJ = 1.124$   
MASS FLOW = 0.486 POUNDS PER SECOND  
THRUST = 15.37 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE        | MICRO<br>PHONE        | MICRO<br>PHONE        |
|-------------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|
| FREQ.<br>HZ             | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 | NO. 13<br>ANGLE 105.0 | NO. 14<br>ANGLE 112.5 | NO. 15<br>ANGLE 120.0 |
| 200.0                   | 66.8                 | 68.9                 | 69.4                 | 68.4                  | 68.1                  | 66.8                  |
| 250.0                   | 69.3                 | 69.7                 | 69.3                 | 69.0                  | 69.7                  | 70.0                  |
| 315.2                   | 70.7                 | 71.4                 | 71.7                 | 72.0                  | 72.7                  | 73.1                  |
| 400.0                   | 74.2                 | 74.4                 | 73.9                 | 73.9                  | 74.1                  | 74.5                  |
| 500.0                   | 76.8                 | 76.2                 | 76.5                 | 76.1                  | 76.4                  | 75.7                  |
| 630.0                   | 79.3                 | 78.6                 | 78.6                 | 78.3                  | 78.1                  | 78.2                  |
| 800.0                   | 81.8                 | 81.2                 | 80.1                 | 79.3                  | 79.9                  | 79.6                  |
| 1000.0                  | 83.8                 | 82.3                 | 81.0                 | 80.3                  | 80.4                  | 80.0                  |
| 1250.0                  | 85.4                 | 83.4                 | 82.7                 | 82.0                  | 81.8                  | 80.9                  |
| 1600.0                  | 85.4                 | 84.0                 | 83.0                 | 82.3                  | 82.3                  | 81.4                  |
| 2000.0                  | 85.8                 | 84.7                 | 83.7                 | 82.7                  | 82.7                  | 82.0                  |
| 2500.0                  | 85.6                 | 84.8                 | 83.9                 | 103.1                 | 83.2                  | 82.1                  |
| 3150.0                  | 85.7                 | 84.7                 | 83.9                 | 83.2                  | 83.0                  | 82.1                  |
| 4000.0                  | 85.6                 | 84.8                 | 83.8                 | 82.9                  | 82.7                  | 81.9                  |
| 5000.0                  | 84.8                 | 84.4                 | 83.6                 | 82.4                  | 82.3                  | 81.5                  |
| 6300.0                  | 84.3                 | 84.4                 | 83.2                 | 82.2                  | 82.1                  | 81.2                  |
| 8000.0                  | 83.8                 | 84.6                 | 82.0                 | 81.7                  | 81.2                  | 80.3                  |
| 10000.0                 | 83.7                 | 84.1                 | 81.2                 | 81.2                  | 80.7                  | 79.5                  |
| 12500.0                 | 83.4                 | 82.6                 | 81.3                 | 80.9                  | 80.4                  | 78.9                  |
| 16000.0                 | 82.4                 | 81.8                 | 80.0                 | 80.4                  | 79.9                  | 78.1                  |
| 20000.0                 | 80.8                 | 82.4                 | 80.2                 | 79.8                  | 79.1                  | 77.5                  |
| 25000.0                 | 80.6                 | 81.5                 | 80.0                 | 79.6                  | 79.0                  | 77.3                  |
| 31500.0                 | 80.7                 | 81.7                 | 80.0                 | 79.0                  | 78.7                  | 77.1                  |
| 40000.0                 | 79.8                 | 81.9                 | 79.8                 | 79.1                  | 78.0                  | 77.3                  |
| OVERALL<br>SPL          | 96.7                 | 96.2                 | 94.9                 | 103.6                 | 94.1                  | 93.2                  |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 7     | 35.3  | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 66.1  |       | 0.0   |       | 67.3  |       | 68.4  |       |  |
| 250.0   | 70.2  |       | 0.0   |       | 69.8  |       | 69.8  |       |  |
| 315.2   | 72.7  |       | 0.0   |       | 70.5  |       | 70.2  |       |  |
| 400.0   | 73.6  |       | 0.0   |       | 72.6  |       | 72.4  |       |  |
| 500.0   | 75.6  |       | 0.0   |       | 74.2  |       | 73.0  |       |  |
| 630.0   | 78.1  |       | 0.0   |       | 75.1  |       | 74.3  |       |  |
| 800.0   | 79.2  |       | 0.0   |       | 76.6  |       | 74.8  |       |  |
| 1000.0  | 79.4  |       | 0.0   |       | 78.1  |       | 76.4  |       |  |
| 1250.0  | 80.5  |       | 0.0   |       | 78.5  |       | 76.3  |       |  |
| 1600.0  | 80.9  |       | 0.0   |       | 78.5  |       | 76.4  |       |  |
| 2000.0  | 81.6  |       | 0.0   |       | 79.1  |       | 76.6  |       |  |
| 2500.0  | 81.8  |       | 0.0   |       | 79.1  |       | 76.6  |       |  |
| 3150.0  | 81.7  |       | 0.0   |       | 79.2  |       | 76.6  |       |  |
| 4000.0  | 81.6  |       | 0.0   |       | 79.4  |       | 76.1  |       |  |
| 5000.0  | 81.3  |       | 0.0   |       | 78.5  |       | 75.5  |       |  |
| 6300.0  | 81.0  |       | 0.0   |       | 77.8  |       | 75.3  |       |  |
| 8000.0  | 80.3  |       | 0.0   |       | 76.4  |       | 74.2  |       |  |
| 10000.0 | 79.4  |       | 0.0   |       | 75.0  |       | 73.0  |       |  |
| 12500.0 | 78.5  |       | 0.0   |       | 73.7  |       | 72.3  |       |  |
| 16000.0 | 77.7  |       | 0.0   |       | 72.7  |       | 70.9  |       |  |
| 20000.0 | 77.0  |       | 0.0   |       | 71.6  |       | 69.5  |       |  |
| 25000.0 | 76.5  |       | 0.0   |       | 71.1  |       | 68.5  |       |  |
| 31500.0 | 75.9  |       | 0.0   |       | 70.2  |       | 67.2  |       |  |
| 40000.0 | 75.4  |       | 0.0   |       | 69.2  |       | 66.0  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 92.8  |       | 0.0   |       | 89.9  |       | 87.8  |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.20 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1605.00 DEG.F, CHAMBER TEMPERATURE = 118.00 DEG.F  
RELATIVE HUMIDITY = 22.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 105

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.295$   
TEMPERATURE RATIO  $TR = 3.573$   
MACH NUMBER  $MJ = 0.634$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 3.350$   
JET DENSITY RATIO  $DJ/D_0 = 0.298$   
JET VELOCITY RATIO  $VJ/A_0 = 1.160$   
JET VELOCITY  $VJ = 1367.6$  FPS

$TR/TJ = 1.066$   
 $DR/D_0 = 0.363$   
 $DR/DJ = 1.215$   
MASS FLOW = 0.634 POUNDS PER SECOND  
THRUST = 25.91 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 87.4  |       | 86.6  |       | 85.1  |       |
| 250.0   | 89.3  |       | 89.8  |       | 89.7  |       |
| 315.2   | 93.7  |       | 92.7  |       | 92.9  |       |
| 400.0   | 96.1  |       | 96.7  |       | 95.4  |       |
| 500.0   | 99.4  |       | 98.4  |       | 97.6  |       |
| 630.0   | 97.9  |       | 100.1 |       | 100.4 |       |
| 800.0   | 101.0 |       | 103.1 |       | 102.6 |       |
| 1000.0  | 100.3 |       | 103.2 |       | 105.1 |       |
| 1250.0  | 101.6 |       | 104.5 |       | 106.9 |       |
| 1600.0  | 101.4 |       | 104.5 |       | 107.0 |       |
| 2000.0  | 101.2 |       | 105.4 |       | 107.0 |       |
| 2500.0  | 100.1 |       | 104.6 |       | 105.9 |       |
| 3150.0  | 96.9  |       | 101.8 |       | 103.1 |       |
| 4000.0  | 93.0  |       | 98.5  |       | 99.9  |       |
| 5000.0  | 89.0  |       | 95.2  |       | 96.8  |       |
| 6300.0  | 85.7  |       | 92.3  |       | 93.9  |       |
| 8000.0  | 83.0  |       | 89.8  |       | 91.6  |       |
| 10000.0 | 80.8  |       | 87.3  |       | 89.5  |       |
| 12500.0 | 79.2  |       | 85.7  |       | 87.6  |       |
| 16000.0 | 78.0  |       | 84.2  |       | 85.9  |       |
| 20000.0 | 75.0  |       | 82.1  |       | 84.3  |       |
| 25000.0 | 72.3  |       | 80.1  |       | 82.7  |       |
| 31500.0 | 1.3   |       | 77.3  |       | 80.0  |       |
| 40000.0 | 2.4   |       | 74.8  |       | 77.6  |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 110.3 |       | 113.3 |       | 114.8 |       |
|         |       |       |       |       | 114.7 |       |
|         |       |       |       |       | 114.0 |       |
|         |       |       |       |       |       | 110.9 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>Hz | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 76.5                                  | 74.7                                  | 75.9                                  | 74.6                                   | 74.4                                   | 74.2                                   |
| 250.0                                  | 79.4                                  | 76.8                                  | 75.6                                  | 75.6                                   | 75.8                                   | 74.7                                   |
| 315.2                                  | 81.3                                  | 79.0                                  | 76.8                                  | 77.3                                   | 76.1                                   | 76.8                                   |
| 400.0                                  | 85.0                                  | 82.0                                  | 79.9                                  | 79.6                                   | 79.3                                   | 78.1                                   |
| 500.0                                  | 87.3                                  | 83.1                                  | 81.7                                  | 80.4                                   | 80.1                                   | 79.5                                   |
| 630.0                                  | 89.2                                  | 86.1                                  | 84.4                                  | 83.4                                   | 83.0                                   | 82.0                                   |
| 800.0                                  | 92.5                                  | 88.6                                  | 86.8                                  | 85.7                                   | 84.7                                   | 84.2                                   |
| 1000.0                                 | 94.8                                  | 90.8                                  | 88.8                                  | 87.7                                   | 86.8                                   | 85.8                                   |
| 1250.0                                 | 97.2                                  | 93.3                                  | 91.0                                  | 89.7                                   | 88.6                                   | 87.6                                   |
| 1600.0                                 | 97.7                                  | 94.4                                  | 92.2                                  | 90.7                                   | 89.6                                   | 88.5                                   |
| 2000.0                                 | 98.6                                  | 95.5                                  | 93.3                                  | 91.9                                   | 90.8                                   | 89.5                                   |
| 2500.0                                 | 99.0                                  | 96.1                                  | 94.0                                  | 92.6                                   | 91.4                                   | 90.2                                   |
| 3150.0                                 | 99.0                                  | 96.7                                  | 94.8                                  | 93.2                                   | 92.4                                   | 90.8                                   |
| 4000.0                                 | 99.1                                  | 97.1                                  | 95.0                                  | 93.4                                   | 92.2                                   | 91.1                                   |
| 5000.0                                 | 98.4                                  | 96.9                                  | 94.7                                  | 93.1                                   | 92.2                                   | 91.0                                   |
| 6300.0                                 | 97.8                                  | 96.7                                  | 94.4                                  | 93.1                                   | 92.0                                   | 90.8                                   |
| 8000.0                                 | 96.8                                  | 96.1                                  | 94.0                                  | 92.8                                   | 91.5                                   | 90.6                                   |
| 10000.0                                | 95.8                                  | 95.4                                  | 93.0                                  | 91.9                                   | 90.8                                   | 90.1                                   |
| 12500.0                                | 94.4                                  | 94.5                                  | 92.3                                  | 91.3                                   | 90.2                                   | 89.5                                   |
| 16000.0                                | 93.0                                  | 93.5                                  | 91.7                                  | 90.5                                   | 89.9                                   | 89.2                                   |
| 20000.0                                | 91.4                                  | 91.8                                  | 90.6                                  | 89.1                                   | 88.5                                   | 87.7                                   |
| 25000.0                                | 89.9                                  | 90.5                                  | 89.6                                  | 87.8                                   | 87.3                                   | 86.6                                   |
| 31500.0                                | 87.4                                  | 88.1                                  | 87.7                                  | 85.5                                   | 85.2                                   | 84.6                                   |
| 40000.0                                | 85.2                                  | 86.4                                  | 85.8                                  | 82.9                                   | 83.6                                   | 82.7                                   |
| OVERALL<br>SPL                         | 109.0                                 | 107.1                                 | 105.1                                 | 103.7                                  | 102.7                                  | 101.7                                  |

# SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 4.07 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1424.00 DEG.F, CHAMBER TEMPERATURE = 61.00 DEG.F  
RELATIVE HUMIDITY = 40.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 177

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.290$   
TEMPERATURE RATIO  $TR = 3.616$   
MACH NUMBER  $MJ = 0.629$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 3.395$   
JET DENSITY RATIO  $\rho J/\rho O = 0.295$   
JET VELOCITY RATIO  $VJ/AO = 1.159$   
JET VELOCITY  $VJ = 1296.7$  FPS

$TR/TJ = 1.065$   
 $DR/\rho O = 0.357$   
 $DR/DJ = 1.211$   
MASS FLOW = 0.625 POUNDS PER SECOND  
THRUST = 25.50 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 69.7                        | 72.4                        | 72.3                        | 72.2                        | 71.3                        | 69.9                        |
| 250.0                                  | 72.4                        | 72.5                        | 71.8                        | 72.1                        | 72.4                        | 73.0                        |
| 315.2                                  | 73.9                        | 74.4                        | 74.2                        | 74.8                        | 75.8                        | 76.8                        |
| 400.0                                  | 76.9                        | 76.8                        | 76.9                        | 77.2                        | 77.6                        | 78.5                        |
| 500.0                                  | 80.0                        | 79.3                        | 79.3                        | 79.7                        | 79.5                        | 79.5                        |
| 630.0                                  | 82.3                        | 81.9                        | 81.8                        | 81.8                        | 81.5                        | 82.4                        |
| 800.0                                  | 85.0                        | 84.6                        | 84.0                        | 83.3                        | 83.2                        | 84.1                        |
| 1000.0                                 | 87.2                        | 86.4                        | 84.6                        | 84.1                        | 83.8                        | 84.2                        |
| 1250.0                                 | 89.2                        | 87.5                        | 86.4                        | 86.2                        | 85.4                        | 85.2                        |
| 1600.0                                 | 90.5                        | 88.3                        | 87.5                        | 86.7                        | 86.5                        | 86.3                        |
| 2000.0                                 | 91.2                        | 89.7                        | 88.4                        | 87.6                        | 87.1                        | 87.1                        |
| 2500.0                                 | 91.1                        | 90.3                        | 88.8                        | 88.1                        | 87.7                        | 87.8                        |
| 3150.0                                 | 91.6                        | 90.6                        | 89.1                        | 88.8                        | 88.0                        | 88.0                        |
| 4000.0                                 | 91.7                        | 90.7                        | 89.5                        | 88.8                        | 88.1                        | 87.9                        |
| 5000.0                                 | 91.1                        | 90.4                        | 89.5                        | 88.3                        | 88.0                        | 87.8                        |
| 6300.0                                 | 90.9                        | 90.7                        | 89.2                        | 88.2                        | 87.9                        | 87.8                        |
| 8000.0                                 | 90.6                        | 91.0                        | 88.1                        | 87.7                        | 87.2                        | 86.9                        |
| 10000.0                                | 90.7                        | 90.7                        | 87.4                        | 87.0                        | 86.6                        | 85.9                        |
| 12500.0                                | 90.3                        | 89.2                        | 87.5                        | 86.6                        | 86.3                        | 85.2                        |
| 16000.0                                | 89.0                        | 88.2                        | 86.1                        | 85.9                        | 85.5                        | 84.4                        |
| 20000.0                                | 87.2                        | 88.5                        | 86.0                        | 85.2                        | 84.7                        | 83.8                        |
| 25000.0                                | 87.0                        | 87.6                        | 85.7                        | 84.9                        | 84.4                        | 83.7                        |
| 31500.0                                | 86.8                        | 87.7                        | 85.4                        | 84.3                        | 84.0                        | 83.3                        |
| 40000.0                                | 85.7                        | 87.6                        | 85.0                        | 84.2                        | 83.2                        | 83.6                        |
| OVERALL<br>SPL                         | 102.4                       | 101.8                       | 100.2                       | 99.5                        | 99.0                        | 98.8                        |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 7<br>ANGLE 35.3 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---------------------------------------|---|---|
| 200.0                                  | 0.0                                     | 0.0                                   | 69.7                                    | 71.4                                    |
| 250.0                                  | 0.0                                     | 0.0                                   | 73.6                                    | 73.5                                    |
| 315.2                                  | 0.0                                     | 0.0                                   | 74.6                                    | 74.1                                    |
| 400.0                                  | 0.0                                     | 0.0                                   | 75.9                                    | 76.3                                    |
| 500.0                                  | 0.0                                     | 0.0                                   | 77.8                                    | 77.4                                    |
| 630.0                                  | 0.0                                     | 0.0                                   | 79.4                                    | 77.9                                    |
| 800.0                                  | 0.0                                     | 0.0                                   | 81.0                                    | 78.8                                    |
| 1000.0                                 | 0.0                                     | 0.0                                   | 82.1                                    | 80.4                                    |
| 1250.0                                 | 0.0                                     | 0.0                                   | 83.7                                    | 81.2                                    |
| 1600.0                                 | 0.0                                     | 0.0                                   | 83.8                                    | 82.1                                    |
| 2000.0                                 | 0.0                                     | 0.0                                   | 84.6                                    | 82.4                                    |
| 2500.0                                 | 0.0                                     | 0.0                                   | 85.0                                    | 82.6                                    |
| 3150.0                                 | 0.0                                     | 0.0                                   | 85.1                                    | 82.8                                    |
| 4000.0                                 | 0.0                                     | 0.0                                   | 85.3                                    | 82.6                                    |
| 5000.0                                 | 0.0                                     | 0.0                                   | 84.6                                    | 82.0                                    |
| 6300.0                                 | 0.0                                     | 0.0                                   | 84.2                                    | 81.9                                    |
| 8000.0                                 | 0.0                                     | 0.0                                   | 83.1                                    | 81.1                                    |
| 10000.0                                | 0.0                                     | 0.0                                   | 81.7                                    | 79.9                                    |
| 12500.0                                | 0.0                                     | 0.0                                   | 80.6                                    | 79.0                                    |
| 16000.0                                | 0.0                                     | 0.0                                   | 79.7                                    | 77.4                                    |
| 20000.0                                | 0.0                                     | 0.0                                   | 78.6                                    | 76.0                                    |
| 25000.0                                | 0.0                                     | 0.0                                   | 77.9                                    | 75.0                                    |
| 31500.0                                | 0.0                                     | 0.0                                   | 77.1                                    | 73.8                                    |
| 40000.0                                | 0.0                                     | 0.0                                   | 76.2                                    | 72.6                                    |
| OVERALL<br>SPL                         | 92.8                                    | 0.0                                   | 95.6                                    | 93.5                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 5.60 PSI, ATMOSPHERIC PRESSURE = 14.22 PSI  
RESERVOIR TEMPERATURE = 1600.00 DEG.F, CHAMBER TEMPERATURE = 120.00 DEG.F  
RELATIVE HUMIDITY = 18.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 106

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.394  
TEMPERATURE RATIO TR = 3.552  
MACH NUMBER MJ = 0.721  
JET STATIC TEMPERATURE RATIO TJ/T0 = 3.271  
JET DENSITY RATIO DJ/D0 = 0.306  
JET VELOCITY RATIO VJ/A0 = 1.305  
JET VELOCITY VJ = 1540.3 FPS

TR/TJ = 1.086  
DR/D0 = 0.392  
DR/DJ = 1.284  
MASS FLOW = 0.730 POUNDS PER SECOND  
THRUST = 33.55 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      | MICRO<br>PHONE<br>NO. ANGLE |      |
|--|-----------------------------|------|-----------------------------|------|-----------------------------|------|-----------------------------|------|-----------------------------|------|-----------------------------|------|
|  | 1                           | 15.0 | 2                           | 22.5 | 3                           | 30.0 | 4                           | 37.5 | 5                           | 45.0 | 6                           | 52.5 |
| 200.0                                  | 90.8                        |      | 89.5                        |      | 85.5                        |      | 83.9                        |      | 83.2                        |      | 80.1                        |      |
| 250.0                                  | 92.8                        |      | 92.1                        |      | 91.0                        |      | 90.2                        |      | 86.9                        |      | 83.2                        |      |
| 315.2                                  | 96.3                        |      | 95.0                        |      | 95.1                        |      | 92.6                        |      | 89.2                        |      | 86.2                        |      |
| 400.0                                  | 99.3                        |      | 99.8                        |      | 97.5                        |      | 95.3                        |      | 93.2                        |      | 89.5                        |      |
| 500.0                                  | 102.1                       |      | 101.4                       |      | 100.3                       |      | 98.4                        |      | 95.7                        |      | 91.9                        |      |
| 630.0                                  | 100.5                       |      | 102.7                       |      | 102.7                       |      | 101.6                       |      | 98.7                        |      | 94.7                        |      |
| 800.0                                  | 104.1                       |      | 106.5                       |      | 105.8                       |      | 104.4                       |      | 102.1                       |      | 98.2                        |      |
| 1000.0                                 | 102.9                       |      | 106.3                       |      | 107.7                       |      | 106.8                       |      | 104.6                       |      | 100.9                       |      |
| 1250.0                                 | 104.5                       |      | 107.9                       |      | 109.8                       |      | 109.7                       |      | 107.7                       |      | 103.4                       |      |
| 1600.0                                 | 104.5                       |      | 108.5                       |      | 109.5                       |      | 110.6                       |      | 108.9                       |      | 105.0                       |      |
| 2000.0                                 | 105.0                       |      | 110.0                       |      | 110.3                       |      | 111.2                       |      | 110.1                       |      | 106.1                       |      |
| 2500.0                                 | 105.4                       |      | 0.0                         |      | 110.4                       |      | 110.9                       |      | 109.6                       |      | 105.8                       |      |
| 3150.0                                 | 104.8                       |      | 109.4                       |      | 109.4                       |      | 109.3                       |      | 108.2                       |      | 105.4                       |      |
| 4000.0                                 | 102.7                       |      | 107.3                       |      | 106.7                       |      | 106.9                       |      | 106.8                       |      | 104.6                       |      |
| 5000.0                                 | 99.0                        |      | 103.8                       |      | 103.6                       |      | 104.2                       |      | 104.6                       |      | 103.3                       |      |
| 6300.0                                 | 95.9                        |      | 101.1                       |      | 101.2                       |      | 102.1                       |      | 103.0                       |      | 102.5                       |      |
| 8000.0                                 | 92.7                        |      | 98.0                        |      | 98.6                        |      | 99.4                        |      | 101.1                       |      | 101.0                       |      |
| 10000.0                                | 89.7                        |      | 95.1                        |      | 96.6                        |      | 97.1                        |      | 99.4                        |      | 99.6                        |      |
| 12500.0                                | 86.8                        |      | 92.8                        |      | 94.9                        |      | 94.9                        |      | 97.6                        |      | 98.1                        |      |
| 16000.0                                | 84.2                        |      | 90.7                        |      | 92.6                        |      | 92.9                        |      | 95.8                        |      | 96.4                        |      |
| 20000.0                                | 81.5                        |      | 88.7                        |      | 90.3                        |      | 90.8                        |      | 93.7                        |      | 94.5                        |      |
| 25000.0                                | 79.7                        |      | 86.6                        |      | 87.8                        |      | 88.6                        |      | 91.5                        |      | 92.5                        |      |
| 31500.0                                | 76.6                        |      | 83.7                        |      | 84.9                        |      | 85.6                        |      | 88.7                        |      | 89.8                        |      |
| 40000.0                                | 73.6                        |      | 81.1                        |      | 82.0                        |      | 82.9                        |      | 85.4                        |      | 87.4                        |      |
| OVERALL<br>SPL                         | 114.4                       |      | 117.5                       |      | 118.6                       |      | 118.8                       |      | 117.7                       |      | 114.8                       |      |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 79.3                                  | 77.7                                  | 77.7                                  | 78.4                                   | 76.5                                   | 76.9                                   |
| 250.0                                  | 80.8                                  | 79.0                                  | 78.5                                  | 78.0                                   | 77.0                                   | 77.1                                   |
| 315.2                                  | 82.6                                  | 80.1                                  | 80.0                                  | 80.2                                   | 78.8                                   | 78.7                                   |
| 400.0                                  | 86.6                                  | 84.0                                  | 82.1                                  | 81.7                                   | 81.4                                   | 80.4                                   |
| 500.0                                  | 89.0                                  | 85.5                                  | 84.1                                  | 83.8                                   | 82.6                                   | 80.9                                   |
| 630.0                                  | 91.0                                  | 87.8                                  | 86.3                                  | 85.8                                   | 84.3                                   | 83.9                                   |
| 800.0                                  | 94.3                                  | 90.5                                  | 88.7                                  | 87.9                                   | 87.1                                   | 86.0                                   |
| 1000.0                                 | 97.0                                  | 93.1                                  | 91.3                                  | 90.0                                   | 88.8                                   | 87.3                                   |
| 1250.0                                 | 99.5                                  | 95.6                                  | 93.5                                  | 91.9                                   | 90.4                                   | 89.4                                   |
| 1600.0                                 | 100.8                                 | 96.6                                  | 94.9                                  | 93.5                                   | 91.5                                   | 90.4                                   |
| 2000.0                                 | 102.0                                 | 98.4                                  | 96.5                                  | 95.2                                   | 92.7                                   | 91.7                                   |
| 2500.0                                 | 102.6                                 | 99.0                                  | 97.4                                  | 96.1                                   | 93.5                                   | 92.7                                   |
| 3150.0                                 | 102.6                                 | 99.4                                  | 98.1                                  | 97.1                                   | 94.4                                   | 93.0                                   |
| 4000.0                                 | 103.5                                 | 100.4                                 | 98.7                                  | 97.5                                   | 94.8                                   | 93.8                                   |
| 5000.0                                 | 102.7                                 | 100.2                                 | 98.6                                  | 97.0                                   | 94.8                                   | 93.6                                   |
| 6300.0                                 | 102.6                                 | 100.4                                 | 98.7                                  | 97.4                                   | 94.9                                   | 93.8                                   |
| 8000.0                                 | 101.4                                 | 99.9                                  | 98.1                                  | 97.0                                   | 94.2                                   | 93.3                                   |
| 10000.0                                | 100.6                                 | 99.1                                  | 97.4                                  | 96.2                                   | 93.5                                   | 92.9                                   |
| 12500.0                                | 99.3                                  | 98.2                                  | 96.8                                  | 95.5                                   | 92.6                                   | 92.1                                   |
| 16000.0                                | 97.4                                  | 97.0                                  | 95.7                                  | 94.2                                   | 91.7                                   | 91.4                                   |
| 20000.0                                | 95.7                                  | 95.7                                  | 94.6                                  | 92.8                                   | 90.5                                   | 90.0                                   |
| 25000.0                                | 93.9                                  | 94.1                                  | 93.3                                  | 91.2                                   | 89.2                                   | 88.7                                   |
| 31500.0                                | 91.2                                  | 92.0                                  | 91.3                                  | 89.1                                   | 87.0                                   | 86.4                                   |
| 40000.0                                | 89.0                                  | 90.2                                  | 89.3                                  | 86.7                                   | 85.3                                   | 84.6                                   |
| OVERALL<br>SPL                         | 112.8                                 | 110.3                                 | 108.7                                 | 107.4                                  | 105.0                                  | 104.1                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 5.51 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1458.00 DEG.F, CHAMBER TEMPERATURE = 61.00 DEG.F  
RELATIVE HUMIDITY = 40.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 178

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.393  
TEMPERATURE RATIO TR = 3.681  
MACH NUMBER MJ = 0.721  
JET STATIC TEMPERATURE RATIO TJ/T0 = 3.391  
JET DENSITY RATIO DJ/D0 = 0.295  
JET VELOCITY RATIO VJ/A0 = 1.327  
JET VELOCITY VJ = 1485.0 FPS

TR/TJ = 1.086  
DR/D0 = 0.378  
DR/DJ = 1.283  
MASS FLOW = 0.717 POUNDS PER SECOND  
THRUST = 33.49 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 71.0                        | 73.8                        | 74.6                        | 74.1                        | 72.8                        | 70.7                        |
| 250.0                                  | 73.8                        | 74.5                        | 73.5                        | 72.7                        | 72.9                        | 73.4                        |
| 315.2                                  | 75.2                        | 76.6                        | 76.1                        | 76.8                        | 76.6                        | 77.8                        |
| 400.0                                  | 78.8                        | 79.4                        | 78.9                        | 79.4                        | 79.5                        | 79.0                        |
| 500.0                                  | 82.1                        | 81.4                        | 81.0                        | 81.4                        | 81.0                        | 80.7                        |
| 630.0                                  | 84.2                        | 83.5                        | 83.8                        | 83.7                        | 84.0                        | 84.4                        |
| 800.0                                  | 87.0                        | 86.2                        | 86.2                        | 85.1                        | 85.3                        | 85.8                        |
| 1000.0                                 | 89.0                        | 88.2                        | 86.8                        | 85.8                        | 86.0                        | 85.7                        |
| 1250.0                                 | 91.6                        | 90.1                        | 88.8                        | 88.1                        | 87.6                        | 87.1                        |
| 1600.0                                 | 92.8                        | 90.5                        | 89.8                        | 88.8                        | 88.4                        | 88.1                        |
| 2000.0                                 | 94.0                        | 92.1                        | 91.1                        | 90.0                        | 89.2                        | 89.0                        |
| 2500.0                                 | 93.9                        | 92.8                        | 91.6                        | 90.6                        | 90.3                        | 89.8                        |
| 3150.0                                 | 94.4                        | 93.3                        | 92.0                        | 91.3                        | 90.5                        | 90.2                        |
| 4000.0                                 | 94.7                        | 93.7                        | 92.5                        | 91.4                        | 90.9                        | 90.4                        |
| 5000.0                                 | 94.5                        | 93.4                        | 92.6                        | 91.3                        | 90.8                        | 90.2                        |
| 6300.0                                 | 94.3                        | 94.1                        | 92.6                        | 91.4                        | 90.9                        | 90.6                        |
| 8000.0                                 | 94.2                        | 94.3                        | 91.7                        | 90.9                        | 90.3                        | 89.8                        |
| 10000.0                                | 94.2                        | 94.2                        | 90.9                        | 90.3                        | 89.8                        | 89.1                        |
| 12500.0                                | 94.1                        | 92.8                        | 91.2                        | 89.9                        | 89.5                        | 88.4                        |
| 16000.0                                | 92.9                        | 91.5                        | 89.9                        | 89.2                        | 88.8                        | 87.7                        |
| 20000.0                                | 91.2                        | 92.2                        | 89.6                        | 88.7                        | 88.1                        | 87.1                        |
| 25000.0                                | 91.0                        | 91.5                        | 89.3                        | 88.4                        | 88.0                        | 87.0                        |
| 31500.0                                | 90.6                        | 91.3                        | 89.1                        | 87.9                        | 87.7                        | 86.8                        |
| 40000.0                                | 89.6                        | 91.4                        | 88.7                        | 87.9                        | 86.8                        | 86.9                        |
| OVERALL<br>SPL                         | 105.5                       | 104.9                       | 103.3                       | 102.3                       | 101.8                       | 101.3                       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 7<br>ANGLE 35.3 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---------------------------------------|---|---|
| 200.0                                  | 0.0                                     | 0.0                                   | 70.4                                    | 72.0                                    |
| 250.0                                  | 0.0                                     | 0.0                                   | 74.1                                    | 74.5                                    |
| 315.2                                  | 0.0                                     | 0.0                                   | 75.6                                    | 74.9                                    |
| 400.0                                  | 0.0                                     | 0.0                                   | 77.0                                    | 77.7                                    |
| 500.0                                  | 0.0                                     | 0.0                                   | 78.7                                    | 78.5                                    |
| 630.0                                  | 0.0                                     | 0.0                                   | 80.3                                    | 78.9                                    |
| 800.0                                  | 0.0                                     | 0.0                                   | 82.3                                    | 79.7                                    |
| 1000.0                                 | 0.0                                     | 0.0                                   | 83.3                                    | 81.7                                    |
| 1250.0                                 | 0.0                                     | 0.0                                   | 85.1                                    | 82.9                                    |
| 1600.0                                 | 0.0                                     | 0.0                                   | 85.6                                    | 84.0                                    |
| 2000.0                                 | 0.0                                     | 0.0                                   | 86.8                                    | 84.4                                    |
| 2500.0                                 | 0.0                                     | 0.0                                   | 87.1                                    | 85.3                                    |
| 3150.0                                 | 0.0                                     | 0.0                                   | 87.4                                    | 85.7                                    |
| 4000.0                                 | 0.0                                     | 0.0                                   | 87.9                                    | 85.3                                    |
| 5000.0                                 | 0.0                                     | 0.0                                   | 87.3                                    | 85.1                                    |
| 6300.0                                 | 0.0                                     | 0.0                                   | 87.2                                    | 85.4                                    |
| 8000.0                                 | 0.0                                     | 0.0                                   | 86.0                                    | 84.5                                    |
| 10000.0                                | 0.0                                     | 0.0                                   | 84.9                                    | 83.5                                    |
| 12500.0                                | 0.0                                     | 0.0                                   | 83.8                                    | 82.5                                    |
| 16000.0                                | 0.0                                     | 0.0                                   | 83.0                                    | 81.1                                    |
| 20000.0                                | 0.0                                     | 0.0                                   | 81.9                                    | 79.7                                    |
| 25000.0                                | 0.0                                     | 0.0                                   | 81.3                                    | 78.6                                    |
| 31500.0                                | 0.0                                     | 0.0                                   | 80.6                                    | 77.5                                    |
| 40000.0                                | 0.0                                     | 0.0                                   | 79.7                                    | 76.4                                    |
| OVERALL<br>SPL                         | 92.8                                    | 0.0                                   | 98.0                                    | 76.1                                    |

SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 7.10 PSI, ATMOSPHERIC PRESSURE = 14.17 PSI  
RESERVOIR TEMPERATURE = 1610.00 DEG.F, CHAMBER TEMPERATURE = 108.00 DEG.F  
RELATIVE HUMIDITY = 23.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 107

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 1.501$   
TEMPERATURE RATIO  $TR = 3.644$   
MACH NUMBER  $MJ = 0.802$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 3.295$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.303$   
JET VELOCITY RATIO  $VJ/A_0 = 1.455$   
JET VELOCITY  $VJ = 1700.0$  FPS

$TR/TJ = 1.106$   
 $DR/D_0 = 0.412$   
 $DR/DJ = 1.357$   
MASS FLOW = 0.809 POUNDS PER SECOND  
THRUST = 41.42 POUNDS

SHOCK CELL LENGTH  $S = 0.000$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 92.8                                  | 90.9                                  | 89.5                                  | 88.5                                  | 85.2                                  | 82.2                                  |
| 250.0                                  | 94.6                                  | 95.1                                  | 93.2                                  | 92.5                                  | 88.8                                  | 84.8                                  |
| 315.2                                  | 99.3                                  | 96.8                                  | 96.7                                  | 94.8                                  | 90.9                                  | 88.4                                  |
| 400.0                                  | 101.4                                 | 101.2                                 | 99.4                                  | 97.2                                  | 95.2                                  | 92.1                                  |
| 500.0                                  | 103.6                                 | 102.7                                 | 102.6                                 | 101.0                                 | 97.4                                  | 94.4                                  |
| 630.0                                  | 102.4                                 | 104.8                                 | 105.3                                 | 103.9                                 | 101.4                                 | 97.8                                  |
| 800.0                                  | 105.3                                 | 107.7                                 | 107.6                                 | 106.9                                 | 104.1                                 | 100.6                                 |
| 1000.0                                 | 104.7                                 | 107.7                                 | 109.0                                 | 108.9                                 | 107.1                                 | 103.7                                 |
| 1250.0                                 | 105.6                                 | 108.9                                 | 111.5                                 | 111.6                                 | 109.9                                 | 106.6                                 |
| 1600.0                                 | 105.5                                 | 109.5                                 | 111.5                                 | 112.1                                 | 111.4                                 | 108.3                                 |
| 2000.0                                 | 105.9                                 | 110.9                                 | 112.2                                 | 113.0                                 | 112.5                                 | 109.4                                 |
| 2500.0                                 | 106.5                                 | 111.7                                 | 113.0                                 | 113.3                                 | 112.8                                 | 110.3                                 |
| 3150.0                                 | 106.9                                 | 112.5                                 | 113.6                                 | 113.2                                 | 112.3                                 | 109.8                                 |
| 4000.0                                 | 106.2                                 | 111.8                                 | 113.0                                 | 112.1                                 | 110.6                                 | 108.7                                 |
| 5000.0                                 | 103.1                                 | 109.5                                 | 111.3                                 | 109.9                                 | 108.6                                 | 107.1                                 |
| 6300.0                                 | 100.0                                 | 106.8                                 | 108.6                                 | 107.6                                 | 106.8                                 | 106.0                                 |
| 8000.0                                 | 97.2                                  | 104.7                                 | 106.0                                 | 105.6                                 | 105.3                                 | 105.2                                 |
| 10000.0                                | 93.3                                  | 103.6                                 | 103.8                                 | 103.4                                 | 103.3                                 | 103.3                                 |
| 12500.0                                | 91.9                                  | 100.0                                 | 101.4                                 | 101.7                                 | 102.2                                 | 102.6                                 |
| 16000.0                                | 89.5                                  | 98.2                                  | 99.5                                  | 99.7                                  | 100.7                                 | 101.0                                 |
| 20000.0                                | 87.0                                  | 95.7                                  | 97.3                                  | 97.2                                  | 98.4                                  | 99.0                                  |
| 25000.0                                | 84.4                                  | 93.6                                  | 95.4                                  | 95.1                                  | 96.5                                  | 97.0                                  |
| 31500.0                                | 81.1                                  | 91.1                                  | 93.1                                  | 92.3                                  | 94.0                                  | 94.9                                  |
| 40000.0                                | 78.5                                  | 88.9                                  | 91.4                                  | 90.4                                  | 91.1                                  | 92.9                                  |
| OVERALL<br>SPL                         | 116.2                                 | 120.7                                 | 122.0                                 | 121.8                                 | 120.8                                 | 118.6                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 0.0                                   | 79.0                                  | 79.6                                  | 78.6                                   | 78.3                                   | 78.0                                   |
| 250.0                                  | 83.3                                  | 81.2                                  | 80.1                                  | 79.6                                   | 79.8                                   | 78.5                                   |
| 315.2                                  | 84.5                                  | 83.0                                  | 82.2                                  | 81.7                                   | 80.4                                   | 79.6                                   |
| 400.0                                  | 88.3                                  | 85.8                                  | 84.1                                  | 83.4                                   | 82.8                                   | 81.6                                   |
| 500.0                                  | 90.3                                  | 88.4                                  | 86.0                                  | 84.9                                   | 84.1                                   | 83.6                                   |
| 630.0                                  | 93.5                                  | 90.6                                  | 88.7                                  | 87.8                                   | 86.6                                   | 85.6                                   |
| 800.0                                  | 96.5                                  | 93.0                                  | 91.2                                  | 89.9                                   | 89.0                                   | 87.5                                   |
| 1000.0                                 | 99.3                                  | 95.8                                  | 93.3                                  | 91.7                                   | 90.7                                   | 89.3                                   |
| 1250.0                                 | 102.2                                 | 98.8                                  | 95.5                                  | 93.9                                   | 92.3                                   | 91.4                                   |
| 1600.0                                 | 103.6                                 | 100.3                                 | 96.8                                  | 95.4                                   | 93.8                                   | 92.7                                   |
| 2000.0                                 | 105.3                                 | 100.9                                 | 98.3                                  | 96.9                                   | 95.2                                   | 93.9                                   |
| 2500.0                                 | 105.6                                 | 102.6                                 | 99.6                                  | 98.2                                   | 96.2                                   | 95.0                                   |
| 3150.0                                 | 105.9                                 | 103.5                                 | 100.8                                 | 99.0                                   | 97.3                                   | 96.1                                   |
| 4000.0                                 | 106.3                                 | 104.3                                 | 101.5                                 | 99.8                                   | 97.8                                   | 96.7                                   |
| 5000.0                                 | 105.9                                 | 104.2                                 | 101.6                                 | 99.9                                   | 97.7                                   | 97.0                                   |
| 6300.0                                 | 105.3                                 | 104.1                                 | 101.4                                 | 100.0                                  | 97.7                                   | 97.2                                   |
| 8000.0                                 | 105.0                                 | 103.7                                 | 101.3                                 | 100.3                                  | 97.7                                   | 97.3                                   |
| 10000.0                                | 103.4                                 | 103.1                                 | 100.7                                 | 99.6                                   | 98.2                                   | 97.5                                   |
| 12500.0                                | 103.0                                 | 102.8                                 | 100.4                                 | 99.5                                   | 96.8                                   | 97.0                                   |
| 16000.0                                | 101.8                                 | 102.1                                 | 99.9                                  | 98.8                                   | 96.4                                   | 96.6                                   |
| 20000.0                                | 99.9                                  | 100.5                                 | 98.8                                  | 97.5                                   | 95.1                                   | 95.3                                   |
| 25000.0                                | 98.4                                  | 98.8                                  | 97.6                                  | 96.2                                   | 94.0                                   | 94.2                                   |
| 31500.0                                | 96.1                                  | 97.0                                  | 95.6                                  | 94.1                                   | 92.2                                   | 92.5                                   |
| 40000.0                                | 93.8                                  | 95.8                                  | 93.6                                  | 92.1                                   | 90.8                                   | 90.9                                   |
| OVERALL<br>SPL                         | 115.9                                 | 114.2                                 | 111.7                                 | 110.4                                  | 108.3                                  | 107.8                                  |



SUPERSONIC JET EXHAUST NOISE

MACH 1.0 NOZZLE

RESERVOIR PRESSURE = 7.04 PSI, ATMOSPHERIC PRESSURE = 14.02 PSI  
RESERVOIR TEMPERATURE = 1472.00 DEG.F, CHAMBER TEMPERATURE = 62.00 DEG.F  
RELATIVE HUMIDITY = 38.0 PERCENT  
GAMMA = 1.330

RUN NUMBER 179

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 1.502  
TEMPERATURE RATIO TR = 3.701  
MACH NUMBER MJ = 0.802  
JET STATIC TEMPERATURE RATIO TJ/T0 = 3.346  
JET DENSITY RATIO DJ/D0 = 0.299  
JET VELOCITY RATIO VJ/A0 = 1.468  
JET VELOCITY VJ = 1643.7 FPS

TR/TJ = 1.106  
DR/D0 = 0.406  
DR/DJ = 1.358  
MASS FLOW = 0.803 POUNDS PER SECOND  
THRUST = 41.50 POUNDS

SHOCK CELL LENGTH S = 0.000 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 72.8                                   | 75.3                                   | 76.3                                   | 75.3                                    | 74.4                                    | 72.4                                    |
| 250.0                                  | 75.9                                   | 76.1                                   | 75.0                                   | 74.4                                    | 74.1                                    | 74.2                                    |
| 315.2                                  | 77.0                                   | 77.8                                   | 77.4                                   | 76.7                                    | 77.4                                    | 77.7                                    |
| 400.0                                  | 79.8                                   | 80.2                                   | 80.2                                   | 80.1                                    | 80.7                                    | 80.6                                    |
| 500.0                                  | 83.3                                   | 82.7                                   | 82.6                                   | 83.1                                    | 82.8                                    | 82.5                                    |
| 630.0                                  | 85.5                                   | 85.2                                   | 85.5                                   | 85.3                                    | 85.4                                    | 85.7                                    |
| 800.0                                  | 87.9                                   | 87.8                                   | 87.8                                   | 86.6                                    | 86.7                                    | 87.5                                    |
| 1000.0                                 | 90.4                                   | 90.0                                   | 88.8                                   | 87.3                                    | 86.7                                    | 87.4                                    |
| 1250.0                                 | 93.2                                   | 91.7                                   | 90.1                                   | 89.6                                    | 88.8                                    | 88.4                                    |
| 1600.0                                 | 94.6                                   | 92.3                                   | 91.5                                   | 90.5                                    | 89.8                                    | 89.5                                    |
| 2000.0                                 | 96.1                                   | 93.6                                   | 92.7                                   | 91.9                                    | 90.7                                    | 90.5                                    |
| 2500.0                                 | 96.3                                   | 94.6                                   | 93.6                                   | 92.8                                    | 91.8                                    | 91.4                                    |
| 3150.0                                 | 96.7                                   | 95.2                                   | 94.1                                   | 93.5                                    | 92.3                                    | 92.1                                    |
| 4000.0                                 | 97.5                                   | 95.9                                   | 94.9                                   | 94.0                                    | 92.9                                    | 92.6                                    |
| 5000.0                                 | 97.1                                   | 95.8                                   | 94.8                                   | 93.8                                    | 92.8                                    | 92.5                                    |
| 6300.0                                 | 97.3                                   | 96.5                                   | 95.2                                   | 94.2                                    | 93.2                                    | 92.9                                    |
| 8000.0                                 | 97.0                                   | 96.7                                   | 94.2                                   | 93.4                                    | 92.4                                    | 92.1                                    |
| 10000.0                                | 97.4                                   | 96.8                                   | 93.8                                   | 93.2                                    | 92.1                                    | 91.6                                    |
| 12500.0                                | 97.4                                   | 95.3                                   | 94.0                                   | 92.9                                    | 91.8                                    | 91.0                                    |
| 16000.0                                | 96.5                                   | 94.5                                   | 93.0                                   | 92.4                                    | 91.3                                    | 90.3                                    |
| 20000.0                                | 94.7                                   | 94.7                                   | 92.7                                   | 91.7                                    | 90.3                                    | 89.8                                    |
| 25000.0                                | 94.2                                   | 93.6                                   | 92.2                                   | 91.2                                    | 90.0                                    | 89.5                                    |
| 31500.0                                | 93.6                                   | 93.3                                   | 91.8                                   | 90.5                                    | 89.4                                    | 89.1                                    |
| 40000.0                                | 92.4                                   | 93.1                                   | 91.3                                   | 90.1                                    | 88.4                                    | 89.0                                    |
| OVERALL<br>SPL                         | 108.2                                  | 107.1                                  | 105.6                                  | 104.8                                   | 103.7                                   | 103.4                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 7 35.3                      | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 79.3                        | 0.0                         | 71.7                        | 73.2                        |
| 250.0                                  | 74.3                        | 0.0                         | 75.7                        | 76.1                        |
| 315.2                                  | 78.1                        | 0.0                         | 76.9                        | 76.6                        |
| 400.0                                  | 79.2                        | 0.0                         | 77.9                        | 78.9                        |
| 500.0                                  | 81.5                        | 0.0                         | 80.5                        | 79.9                        |
| 630.0                                  | 85.9                        | 0.0                         | 82.1                        | 80.2                        |
| 800.0                                  | 87.1                        | 0.0                         | 83.9                        | 81.2                        |
| 1000.0                                 | 87.1                        | 0.0                         | 85.0                        | 83.4                        |
| 1250.0                                 | 87.3                        | 0.0                         | 86.8                        | 84.7                        |
| 1600.0                                 | 88.7                        | 0.0                         | 87.4                        | 85.5                        |
| 2000.0                                 | 90.2                        | 0.0                         | 88.6                        | 86.3                        |
| 2500.0                                 | 90.4                        | 0.0                         | 89.1                        | 87.4                        |
| 3150.0                                 | 91.2                        | 0.0                         | 89.4                        | 87.9                        |
| 4000.0                                 | 91.8                        | 0.0                         | 90.2                        | 88.0                        |
| 5000.0                                 | 91.5                        | 0.0                         | 89.7                        | 87.8                        |
| 6300.0                                 | 91.8                        | 0.0                         | 89.7                        | 88.0                        |
| 8000.0                                 | 91.0                        | 0.0                         | 88.5                        | 87.0                        |
| 10000.0                                | 90.6                        | 0.0                         | 87.7                        | 86.2                        |
| 12500.0                                | 89.9                        | 0.0                         | 86.7                        | 85.4                        |
| 16000.0                                | 89.4                        | 0.0                         | 86.2                        | 84.2                        |
| 20000.0                                | 88.3                        | 0.0                         | 84.9                        | 82.6                        |
| 25000.0                                | 87.7                        | 0.0                         | 84.1                        | 81.5                        |
| 31500.0                                | 86.8                        | 0.0                         | 83.1                        | 80.1                        |
| 40000.0                                | 85.9                        | 0.0                         | 82.3                        | 78.9                        |
| OVERALL<br>SPL                         | 102.4                       | 0.0                         | 100.2                       | 98.4                        |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.50 PSI, ATMOSPHERIC PRESSURE = 14.26 PSI  
RESERVOIR TEMPERATURE = 69.00 DEG.F, CHAMBER TEMPERATURE = 72.00 DEG.F  
RELATIVE HUMIDITY = 78.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 73

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 3.069  
TEMPERATURE RATIO TR = 0.994  
MACH NUMBER MJ = 1.374  
JET STATIC TEMPERATURE RATIO  $T_j/T_0$  = 0.722  
JET DENSITY RATIO  $\rho_j/\rho_0$  = 1.305  
JET VELOCITY RATIO  $V_j/A_0$  = 1.167  
JET VELOCITY VJ = 1319.9 FPS

TR/TJ = 1.378  
DR/D0 = 3.086  
DR/DJ = 2.228  
MASS FLOW = 2.961 POUNDS PER SECOND  
THRUST = 121.70 POUNDS

SHOCK CELL LENGTH S = 2.073 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 96.3                                  | 96.0                                  | 87.5                                  | 82.6                                  | 80.9                                  | 78.9                                  |
| 250.0                                  | 97.7                                  | 97.2                                  | 92.5                                  | 86.0                                  | 84.3                                  | 82.1                                  |
| 315.2                                  | 101.0                                 | 98.6                                  | 96.2                                  | 89.6                                  | 86.5                                  | 84.8                                  |
| 400.0                                  | 102.7                                 | 103.5                                 | 98.1                                  | 93.3                                  | 89.8                                  | 87.5                                  |
| 500.0                                  | 105.2                                 | 104.9                                 | 101.4                                 | 95.9                                  | 92.6                                  | 89.6                                  |
| 630.0                                  | 106.6                                 | 107.5                                 | 104.6                                 | 98.8                                  | 95.4                                  | 92.2                                  |
| 800.0                                  | 109.8                                 | 111.2                                 | 107.0                                 | 102.1                                 | 98.3                                  | 94.5                                  |
| 1000.0                                 | 109.6                                 | 111.0                                 | 110.0                                 | 104.5                                 | 100.7                                 | 97.1                                  |
| 1250.0                                 | 110.5                                 | 113.4                                 | 112.1                                 | 107.0                                 | 102.9                                 | 98.6                                  |
| 1600.0                                 | 110.8                                 | 113.3                                 | 112.7                                 | 107.3                                 | 103.4                                 | 99.7                                  |
| 2000.0                                 | 110.8                                 | 114.0                                 | 112.8                                 | 108.1                                 | 104.8                                 | 101.2                                 |
| 2500.0                                 | 111.1                                 | 113.8                                 | 111.8                                 | 107.4                                 | 104.9                                 | 101.5                                 |
| 3150.0                                 | 110.4                                 | 112.8                                 | 110.5                                 | 106.5                                 | 104.7                                 | 101.8                                 |
| 4000.0                                 | 109.5                                 | 111.2                                 | 108.8                                 | 105.7                                 | 105.2                                 | 102.2                                 |
| 5000.0                                 | 107.4                                 | 108.8                                 | 106.3                                 | 104.1                                 | 104.4                                 | 102.3                                 |
| 6300.0                                 | 105.6                                 | 106.8                                 | 104.5                                 | 103.1                                 | 104.2                                 | 102.3                                 |
| 8000.0                                 | 103.1                                 | 104.6                                 | 102.5                                 | 101.8                                 | 103.5                                 | 101.8                                 |
| 10000.0                                | 100.8                                 | 102.6                                 | 100.9                                 | 100.6                                 | 102.8                                 | 101.5                                 |
| 12500.0                                | 98.4                                  | 100.7                                 | 99.5                                  | 99.5                                  | 102.0                                 | 100.9                                 |
| 16000.0                                | 96.2                                  | 99.0                                  | 98.0                                  | 98.2                                  | 101.0                                 | 100.3                                 |
| 20000.0                                | 93.9                                  | 97.0                                  | 96.5                                  | 96.8                                  | 99.7                                  | 99.3                                  |
| 25000.0                                | 91.8                                  | 95.7                                  | 95.4                                  | 95.5                                  | 98.6                                  | 98.8                                  |
| 31500.0                                | 90.2                                  | 94.4                                  | 94.1                                  | 94.2                                  | 97.7                                  | 98.2                                  |
| 40000.0                                | 88.8                                  | 93.7                                  | 92.9                                  | 93.5                                  | 96.6                                  | 97.9                                  |
| OVERALL<br>SPL                         | 120.5                                 | 122.6                                 | 120.8                                 | 116.7                                 | 115.3                                 | 113.1                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 79.0                | 79.2                | 80.0                | 78.3                 | 78.2                 | 77.8                 |
| 250.0                   | 81.4                | 81.2                | 81.2                | 80.2                 | 80.1                 | 78.8                 |
| 315.2                   | 83.4                | 83.0                | 83.1                | 82.5                 | 81.0                 | 80.8                 |
| 400.0                   | 86.5                | 86.1                | 85.9                | 84.5                 | 84.1                 | 83.7                 |
| 500.0                   | 87.8                | 87.4                | 86.7                | 85.3                 | 84.6                 | 84.2                 |
| 630.0                   | 90.4                | 89.6                | 89.0                | 87.9                 | 87.2                 | 86.5                 |
| 800.0                   | 91.9                | 91.0                | 90.3                | 88.8                 | 88.8                 | 88.6                 |
| 1000.0                  | 93.7                | 92.5                | 92.1                | 90.5                 | 90.0                 | 89.5                 |
| 1250.0                  | 95.3                | 94.2                | 93.3                | 92.3                 | 91.9                 | 91.7                 |
| 1600.0                  | 96.9                | 95.3                | 94.7                | 93.2                 | 92.9                 | 92.2                 |
| 2000.0                  | 98.1                | 96.6                | 95.7                | 94.0                 | 93.7                 | 93.1                 |
| 2500.0                  | 98.7                | 97.2                | 96.2                | 94.6                 | 94.4                 | 93.9                 |
| 3150.0                  | 99.4                | 97.8                | 96.8                | 95.5                 | 95.3                 | 94.6                 |
| 4000.0                  | 100.0               | 98.7                | 97.6                | 95.8                 | 95.7                 | 95.2                 |
| 5000.0                  | 100.4               | 98.9                | 97.6                | 96.3                 | 96.3                 | 96.0                 |
| 6300.0                  | 100.6               | 99.4                | 97.8                | 97.0                 | 97.1                 | 96.9                 |
| 8000.0                  | 100.5               | 99.5                | 98.1                | 97.0                 | 97.3                 | 97.0                 |
| 10000.0                 | 100.6               | 99.4                | 98.0                | 97.0                 | 97.2                 | 97.5                 |
| 12500.0                 | 100.4               | 99.3                | 98.0                | 96.9                 | 97.2                 | 97.5                 |
| 16000.0                 | 100.2               | 99.1                | 98.1                | 96.6                 | 97.3                 | 97.3                 |
| 20000.0                 | 99.6                | 98.6                | 97.7                | 95.9                 | 96.6                 | 96.4                 |
| 25000.0                 | 99.1                | 98.2                | 97.6                | 95.5                 | 96.2                 | 95.9                 |
| 31500.0                 | 98.3                | 97.7                | 97.4                | 94.9                 | 95.8                 | 95.1                 |
| 40000.0                 | 97.6                | 97.6                | 96.9                | 94.2                 | 95.7                 | 94.6                 |
| OVERALL<br>SPL          | 111.6               | 110.4               | 109.4               | 107.9                | 108.2                | 107.9                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.50 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 47.00 DEG.F, CHAMBER TEMPERATURE = 56.00 DEG.F  
RELATIVE HUMIDITY = 41.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 180

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.092$   
TEMPERATURE RATIO  $TR = 0.983$   
MACH NUMBER  $MJ = 1.380$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 0.712$   
JET DENSITY RATIO  $DJ/DO = 1.405$   
JET VELOCITY RATIO  $VJ/AO = 1.164$   
JET VELOCITY  $VJ = 1295.9$  FPS

$TR/TJ = 1.381$   
 $OR/DO = 3.147$   
 $DR/DJ = 2.240$   
MASS FLOW = 2.994 POUNDS PER SECOND  
THRUST = 122.67 POUNDS

SHOCK CELL LENGTH  $S = 2.091$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 73.6                                   | 76.1                                   | 76.9                                   | 76.1                                    | 75.3                                    | 74.2                                    |
| 250.0                                  | 76.1                                   | 77.6                                   | 76.7                                   | 75.7                                    | 75.0                                    | 74.1                                    |
| 315.2                                  | 77.2                                   | 77.9                                   | 77.9                                   | 77.6                                    | 77.1                                    | 76.2                                    |
| 400.0                                  | 80.2                                   | 80.7                                   | 80.3                                   | 80.3                                    | 80.5                                    | 80.4                                    |
| 500.0                                  | 83.0                                   | 82.6                                   | 83.4                                   | 83.2                                    | 83.3                                    | 83.4                                    |
| 630.0                                  | 84.9                                   | 84.8                                   | 85.5                                   | 85.8                                    | 85.3                                    | 85.5                                    |
| 800.0                                  | 87.3                                   | 87.4                                   | 88.1                                   | 87.4                                    | 86.6                                    | 86.2                                    |
| 1000.0                                 | 89.2                                   | 89.8                                   | 89.5                                   | 88.6                                    | 87.9                                    | 87.6                                    |
| 1250.0                                 | 91.4                                   | 92.0                                   | 91.2                                   | 90.4                                    | 90.1                                    | 89.6                                    |
| 1600.0                                 | 92.9                                   | 92.8                                   | 91.8                                   | 91.2                                    | 91.0                                    | 90.3                                    |
| 2000.0                                 | 94.4                                   | 93.9                                   | 93.0                                   | 92.4                                    | 92.0                                    | 91.5                                    |
| 2500.0                                 | 95.3                                   | 94.4                                   | 93.9                                   | 93.0                                    | 92.7                                    | 92.1                                    |
| 3150.0                                 | 95.9                                   | 95.1                                   | 94.4                                   | 94.0                                    | 94.0                                    | 93.4                                    |
| 4000.0                                 | 96.2                                   | 95.8                                   | 95.3                                   | 95.0                                    | 95.6                                    | 95.4                                    |
| 5000.0                                 | 96.3                                   | 96.7                                   | 96.7                                   | 96.4                                    | 97.2                                    | 96.7                                    |
| 6300.0                                 | 97.0                                   | 98.1                                   | 97.6                                   | 97.3                                    | 97.8                                    | 97.2                                    |
| 8000.0                                 | 97.5                                   | 98.6                                   | 97.2                                   | 96.8                                    | 97.4                                    | 96.8                                    |
| 10000.0                                | 97.8                                   | 98.6                                   | 96.7                                   | 96.7                                    | 97.4                                    | 96.5                                    |
| 12500.0                                | 98.1                                   | 97.8                                   | 97.3                                   | 96.5                                    | 97.4                                    | 96.5                                    |
| 16000.0                                | 97.4                                   | 97.5                                   | 96.6                                   | 96.3                                    | 97.1                                    | 96.3                                    |
| 20000.0                                | 96.3                                   | 98.0                                   | 96.7                                   | 96.1                                    | 96.6                                    | 95.9                                    |
| 25000.0                                | 96.6                                   | 97.7                                   | 96.9                                   | 96.1                                    | 96.4                                    | 96.0                                    |
| 31500.0                                | 96.3                                   | 98.2                                   | 96.9                                   | 95.5                                    | 96.0                                    | 95.9                                    |
| 40000.0                                | 95.9                                   | 98.3                                   | 96.6                                   | 95.4                                    | 94.8                                    | 95.7                                    |
| OVERALL<br>SPL                         | 108.4                                  | 109.1                                  | 108.1                                  | 107.6                                   | 108.0                                   | 107.5                                   |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 73.1  |       | 71.7  |       | 72.2  |       | 72.4  |       |  |
| 250.0   | 74.1  |       | 73.6  |       | 74.3  |       | 74.4  |       |  |
| 315.2   | 76.2  |       | 75.6  |       | 75.6  |       | 75.5  |       |  |
| 400.0   | 80.1  |       | 78.1  |       | 77.6  |       | 77.7  |       |  |
| 500.0   | 82.2  |       | 81.6  |       | 80.5  |       | 79.0  |       |  |
| 630.0   | 84.8  |       | 84.0  |       | 82.5  |       | 80.2  |       |  |
| 800.0   | 85.0  |       | 84.1  |       | 83.4  |       | 81.7  |       |  |
| 1000.0  | 87.3  |       | 85.9  |       | 85.3  |       | 83.9  |       |  |
| 1250.0  | 89.2  |       | 88.6  |       | 88.0  |       | 86.9  |       |  |
| 1600.0  | 89.8  |       | 89.4  |       | 89.0  |       | 88.5  |       |  |
| 2000.0  | 91.1  |       | 90.8  |       | 90.8  |       | 89.8  |       |  |
| 2500.0  | 91.9  |       | 91.8  |       | 92.0  |       | 91.5  |       |  |
| 3150.0  | 93.4  |       | 93.8  |       | 94.4  |       | 93.9  |       |  |
| 4000.0  | 95.9  |       | 96.2  |       | 97.1  |       | 96.8  |       |  |
| 5000.0  | 96.9  |       | 96.8  |       | 96.9  |       | 97.4  |       |  |
| 6300.0  | 97.2  |       | 97.0  |       | 96.5  |       | 96.5  |       |  |
| 8000.0  | 97.0  |       | 96.8  |       | 95.7  |       | 95.5  |       |  |
| 10000.0 | 96.5  |       | 96.0  |       | 94.9  |       | 94.4  |       |  |
| 12500.0 | 96.4  |       | 95.9  |       | 94.5  |       | 94.0  |       |  |
| 16000.0 | 96.1  |       | 95.4  |       | 94.1  |       | 93.0  |       |  |
| 20000.0 | 95.6  |       | 94.6  |       | 93.2  |       | 91.7  |       |  |
| 25000.0 | 95.3  |       | 94.2  |       | 93.0  |       | 91.0  |       |  |
| 31500.0 | 94.7  |       | 93.6  |       | 92.3  |       | 89.6  |       |  |
| 40000.0 | 94.0  |       | 93.3  |       | 91.2  |       | 88.4  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 107.2 |       | 106.8 |       | 106.2 |       | 105.6 |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.50 PSI, ATMOSPHERIC PRESSURE = 14.26 PSI  
RESERVOIR TEMPERATURE = 240.00 DEG.F, CHAMBER TEMPERATURE = 81.00 DEG.F  
RELATIVE HUMIDITY = 63.0 PERCENT  
GAMMA = 1.398

RUN NUMBER 74

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.069$   
TEMPERATURE RATIO  $TR = 1.294$   
MACH NUMBER  $MJ = 1.375$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.940$   
JET DENSITY RATIO  $DJ/D_0 = 1.063$   
JET VELOCITY RATIO  $VJ/A_0 = 1.333$   
JET VELOCITY  $VJ = 1519.8$  FPS

$TR/TJ = 1.376$   
 $DR/D_0 = 2.372$   
 $DR/DJ = 2.230$   
MASS FLOW = 2.595 POUNDS PER SECOND  
THRUST = 121.80 POUNDS

SHOCK CELL LENGTH  $S = 2.075$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 97.2                                  | 98.0                                  | 90.5                                  | 86.1                                  | 84.6                                  | 81.4                                  |
| 250.0                                  | 99.0                                  | 99.8                                  | 95.0                                  | 90.2                                  | 87.8                                  | 83.2                                  |
| 315.2                                  | 102.8                                 | 101.4                                 | 100.1                                 | 93.5                                  | 90.9                                  | 87.0                                  |
| 400.0                                  | 105.0                                 | 106.1                                 | 102.7                                 | 98.0                                  | 94.6                                  | 90.5                                  |
| 500.0                                  | 108.8                                 | 107.8                                 | 106.1                                 | 100.9                                 | 97.8                                  | 92.3                                  |
| 630.0                                  | 108.6                                 | 110.4                                 | 109.8                                 | 104.8                                 | 101.2                                 | 95.7                                  |
| 800.0                                  | 111.8                                 | 113.5                                 | 112.3                                 | 108.4                                 | 104.4                                 | 98.3                                  |
| 1000.0                                 | 111.8                                 | 114.1                                 | 115.0                                 | 111.2                                 | 107.6                                 | 101.6                                 |
| 1250.0                                 | 113.0                                 | 116.1                                 | 117.6                                 | 114.3                                 | 110.7                                 | 103.9                                 |
| 1600.0                                 | 113.4                                 | 116.5                                 | 117.8                                 | 115.5                                 | 112.1                                 | 105.5                                 |
| 2000.0                                 | 113.9                                 | 117.8                                 | 118.5                                 | 116.5                                 | 113.6                                 | 106.8                                 |
| 2500.0                                 | 114.5                                 | 118.2                                 | 118.8                                 | 116.7                                 | 113.6                                 | 107.5                                 |
| 3150.0                                 | 114.7                                 | 118.5                                 | 118.8                                 | 116.4                                 | 113.0                                 | 108.2                                 |
| 4000.0                                 | 114.3                                 | 118.0                                 | 118.5                                 | 115.4                                 | 112.6                                 | 108.4                                 |
| 5000.0                                 | 112.6                                 | 116.7                                 | 116.7                                 | 113.3                                 | 111.7                                 | 108.5                                 |
| 6300.0                                 | 111.2                                 | 115.4                                 | 115.3                                 | 112.1                                 | 111.0                                 | 108.4                                 |
| 8000.0                                 | 109.8                                 | 113.8                                 | 113.6                                 | 110.4                                 | 110.1                                 | 107.8                                 |
| 10000.0                                | 108.8                                 | 112.7                                 | 112.1                                 | 109.4                                 | 109.3                                 | 107.5                                 |
| 12500.0                                | 107.6                                 | 111.7                                 | 110.8                                 | 108.2                                 | 108.5                                 | 106.8                                 |
| 16000.0                                | 105.9                                 | 110.1                                 | 109.1                                 | 106.5                                 | 107.1                                 | 105.9                                 |
| 20000.0                                | 104.0                                 | 108.5                                 | 107.7                                 | 105.3                                 | 105.9                                 | 105.1                                 |
| 25000.0                                | 102.2                                 | 107.0                                 | 106.7                                 | 104.0                                 | 104.8                                 | 104.5                                 |
| 31500.0                                | 100.1                                 | 105.5                                 | 105.3                                 | 102.7                                 | 103.8                                 | 103.8                                 |
| 40000.0                                | 98.8                                  | 104.4                                 | 104.1                                 | 101.9                                 | 102.6                                 | 103.4                                 |
| OVERALL<br>SPL                         | 124.3                                 | 127.7                                 | 128.0                                 | 125.3                                 | 122.8                                 | 118.9                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 80.2                                  | 81.0                                  | 80.4                                  | 79.2                                   | 79.0                                   | 78.8                                   |
| 250.0                                  | 82.8                                  | 81.9                                  | 81.3                                  | 80.3                                   | 81.2                                   | 79.5                                   |
| 315.2                                  | 84.5                                  | 84.2                                  | 84.1                                  | 83.2                                   | 82.9                                   | 82.2                                   |
| 400.0                                  | 87.4                                  | 87.2                                  | 86.7                                  | 85.4                                   | 85.8                                   | 84.3                                   |
| 500.0                                  | 89.9                                  | 88.3                                  | 88.1                                  | 86.7                                   | 85.8                                   | 84.8                                   |
| 630.0                                  | 92.9                                  | 91.7                                  | 90.5                                  | 90.1                                   | 89.3                                   | 86.2                                   |
| 800.0                                  | 95.2                                  | 93.4                                  | 92.2                                  | 91.0                                   | 90.7                                   | 90.5                                   |
| 1000.0                                 | 97.2                                  | 95.3                                  | 94.2                                  | 92.8                                   | 92.0                                   | 91.3                                   |
| 1250.0                                 | 99.2                                  | 96.9                                  | 96.1                                  | 94.5                                   | 93.8                                   | 93.8                                   |
| 1600.0                                 | 101.0                                 | 98.8                                  | 97.3                                  | 95.9                                   | 95.3                                   | 94.8                                   |
| 2000.0                                 | 102.6                                 | 100.3                                 | 98.8                                  | 97.3                                   | 96.5                                   | 95.9                                   |
| 2500.0                                 | 103.4                                 | 101.4                                 | 99.5                                  | 98.1                                   | 97.4                                   | 96.9                                   |
| 3150.0                                 | 104.5                                 | 102.2                                 | 100.4                                 | 99.2                                   | 98.4                                   | 97.7                                   |
| 4000.0                                 | 105.4                                 | 103.3                                 | 101.5                                 | 99.9                                   | 99.1                                   | 98.5                                   |
| 5000.0                                 | 105.8                                 | 103.7                                 | 101.7                                 | 100.5                                  | 99.8                                   | 99.4                                   |
| 6300.0                                 | 106.2                                 | 104.4                                 | 102.3                                 | 101.3                                  | 100.6                                  | 100.6                                  |
| 8000.0                                 | 106.1                                 | 104.4                                 | 102.6                                 | 101.4                                  | 101.0                                  | 101.0                                  |
| 10000.0                                | 106.2                                 | 104.6                                 | 102.6                                 | 101.8                                  | 101.3                                  | 101.7                                  |
| 12500.0                                | 106.1                                 | 104.8                                 | 103.1                                 | 102.0                                  | 101.4                                  | 102.0                                  |
| 16000.0                                | 105.6                                 | 104.7                                 | 103.1                                 | 101.5                                  | 101.4                                  | 101.6                                  |
| 20000.0                                | 105.0                                 | 104.3                                 | 103.1                                 | 101.1                                  | 101.0                                  | 100.9                                  |
| 25000.0                                | 104.6                                 | 103.9                                 | 103.2                                 | 100.9                                  | 100.6                                  | 100.3                                  |
| 31500.0                                | 103.8                                 | 103.4                                 | 102.9                                 | 100.2                                  | 100.0                                  | 99.4                                   |
| 40000.0                                | 103.0                                 | 103.3                                 | 102.4                                 | 99.4                                   | 99.8                                   | 98.6                                   |
| OVERALL<br>SPL                         | 116.8                                 | 115.4                                 | 113.9                                 | 112.3                                  | 111.9                                  | 111.7                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.50 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 202.00 DEG.F, CHAMBER TEMPERATURE = 54.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.398

RUN NUMBER 181

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 3.092  
TEMPERATURE RATIO TR = 1.288  
MACH NUMBER MJ = 1.380  
JET STATIC TEMPERATURE RATIO TJ/TO = 0.934  
JET DENSITY RATIO DJ/DO = 1.071  
JET VELOCITY RATIO VJ/A0 = 1.334  
JET VELOCITY VJ = 1482.2 FPS

TR/TJ = 1.379  
OR/DO = 2.401  
OR/DJ = 2.242  
MASS FLOW = 2.615 POUNDS PER SECOND  
THRUST = 122.77 POUNDS

SHOCK CELL LENGTH S = 2.093 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 74.5                                   | 77.4                                   | 80.8                                   | 76.7                                    | 76.1                                    | 74.6                                    |
| 250.0                                  | 78.3                                   | 79.2                                   | 80.6                                   | 77.2                                    | 76.1                                    | 75.4                                    |
| 315.2                                  | 78.9                                   | 79.4                                   | 80.6                                   | 77.8                                    | 77.5                                    | 77.1                                    |
| 400.0                                  | 82.4                                   | 82.3                                   | 82.6                                   | 81.6                                    | 81.5                                    | 82.4                                    |
| 500.0                                  | 85.3                                   | 84.6                                   | 84.3                                   | 85.0                                    | 85.0                                    | 85.2                                    |
| 630.0                                  | 87.3                                   | 86.5                                   | 87.0                                   | 87.1                                    | 88.2                                    | 87.5                                    |
| 800.0                                  | 89.3                                   | 89.5                                   | 89.0                                   | 88.4                                    | 88.4                                    | 88.1                                    |
| 1000.0                                 | 91.6                                   | 91.6                                   | 90.4                                   | 89.9                                    | 89.2                                    | 89.4                                    |
| 1250.0                                 | 94.2                                   | 93.8                                   | 92.5                                   | 92.3                                    | 91.7                                    | 91.4                                    |
| 1600.0                                 | 95.6                                   | 94.7                                   | 93.3                                   | 93.3                                    | 92.7                                    | 92.4                                    |
| 2000.0                                 | 97.4                                   | 96.0                                   | 94.4                                   | 94.4                                    | 93.9                                    | 93.4                                    |
| 2500.0                                 | 98.2                                   | 96.7                                   | 95.0                                   | 95.5                                    | 95.0                                    | 94.6                                    |
| 3150.0                                 | 98.8                                   | 97.4                                   | 96.1                                   | 96.6                                    | 96.2                                    | 95.8                                    |
| 4000.0                                 | 99.3                                   | 98.2                                   | 96.9                                   | 97.7                                    | 97.7                                    | 97.8                                    |
| 5000.0                                 | 99.5                                   | 99.1                                   | 97.8                                   | 98.9                                    | 99.4                                    | 99.8                                    |
| 6300.0                                 | 100.1                                  | 100.5                                  | 98.8                                   | 100.4                                   | 100.7                                   | 101.0                                   |
| 8000.0                                 | 100.6                                  | 101.5                                  | 98.2                                   | 100.2                                   | 100.8                                   | 100.9                                   |
| 10000.0                                | 101.5                                  | 101.7                                  | 97.5                                   | 100.5                                   | 100.5                                   | 100.6                                   |
| 12500.0                                | 101.9                                  | 101.0                                  | 97.5                                   | 100.4                                   | 100.9                                   | 100.5                                   |
| 16000.0                                | 101.1                                  | 101.1                                  | 95.9                                   | 100.1                                   | 100.4                                   | 99.9                                    |
| 20000.0                                | 100.1                                  | 101.3                                  | 94.9                                   | 99.6                                    | 99.7                                    | 99.1                                    |
| 25000.0                                | 100.2                                  | 100.6                                  | 93.3                                   | 99.2                                    | 99.3                                    | 98.7                                    |
| 31500.0                                | 100.1                                  | 101.1                                  | 92.0                                   | 98.8                                    | 98.9                                    | 98.5                                    |
| 40000.0                                | 99.8                                   | 101.4                                  | 90.3                                   | 98.8                                    | 98.0                                    | 98.6                                    |
| OVERALL<br>SPL                         | 111.8                                  | 111.9                                  | 108.1                                  | 110.7                                   | 110.8                                   | 110.7                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 72.5  |       | 71.8  |       | 72.5  |       | 73.6  |  |
| 250.0   |       | 75.0  |       | 74.3  |       | 75.8  |       | 75.6  |  |
| 315.2   |       | 76.4  |       | 75.9  |       | 76.7  |       | 76.7  |  |
| 400.0   |       | 80.7  |       | 79.6  |       | 78.8  |       | 78.5  |  |
| 500.0   |       | 84.9  |       | 84.0  |       | 82.4  |       | 80.7  |  |
| 630.0   |       | 88.2  |       | 87.4  |       | 85.0  |       | 81.5  |  |
| 800.0   |       | 87.4  |       | 86.4  |       | 85.8  |       | 84.0  |  |
| 1000.0  |       | 88.9  |       | 87.9  |       | 87.0  |       | 85.6  |  |
| 1250.0  |       | 90.8  |       | 90.6  |       | 90.3  |       | 88.7  |  |
| 1600.0  |       | 91.7  |       | 91.0  |       | 91.3  |       | 90.6  |  |
| 2000.0  |       | 93.0  |       | 92.9  |       | 92.6  |       | 91.3  |  |
| 2500.0  |       | 94.1  |       | 94.1  |       | 94.4  |       | 93.9  |  |
| 3150.0  |       | 95.6  |       | 95.7  |       | 96.3  |       | 95.5  |  |
| 4000.0  |       | 98.0  |       | 98.3  |       | 99.6  |       | 98.8  |  |
| 5000.0  |       | 99.8  |       | 99.7  |       | 100.3 |       | 100.3 |  |
| 6300.0  |       | 100.8 |       | 100.7 |       | 100.7 |       | 100.6 |  |
| 8000.0  |       | 100.7 |       | 100.4 |       | 99.9  |       | 99.8  |  |
| 10000.0 |       | 100.9 |       | 99.6  |       | 99.0  |       | 98.5  |  |
| 12500.0 |       | 100.1 |       | 99.1  |       | 98.2  |       | 97.6  |  |
| 16000.0 |       | 99.3  |       | 98.5  |       | 97.6  |       | 96.1  |  |
| 20000.0 |       | 98.5  |       | 97.4  |       | 96.5  |       | 94.8  |  |
| 25000.0 |       | 97.8  |       | 96.6  |       | 95.9  |       | 93.6  |  |
| 31500.0 |       | 97.3  |       | 96.1  |       | 95.3  |       | 92.6  |  |
| 40000.0 |       | 96.9  |       | 95.9  |       | 94.4  |       | 91.5  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 110.3 |       | 109.7 |       | 109.5 |       | 108.8 |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.50 PSI, ATMOSPHERIC PRESSURE = 14.26 PSI  
RESERVOIR TEMPERATURE = 400.00 DEG.F, CHAMBER TEMPERATURE : 78.00 DEG.F  
RELATIVE HUMIDITY = 64.0 PERCENT  
 $\gamma = 1.387$

RUN NUMBER 75

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.069$   
TEMPERATURE RATIO  $TR = 1.599$   
MACH NUMBER  $MJ = 1.378$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.169$   
JET DENSITY RATIO  $DJ/D0 = 0.855$   
JET VELOCITY RATIO  $VJ/A0 = 1.490$   
JET VELOCITY  $VJ = 1693.8$  FPS

$TR/TJ = 1.367$   
 $DR/D0 = 1.920$   
 $DR/DJ = 2.244$   
MASS FLOW = 2.333 POUNDS PER SECOND  
THRUST = 122.36 POUNDS

SHOCK CELL LENGTH  $S = 2.085$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 1 15.0                      | 2 22.5                      | 3 30.0                      | 4 37.5                      | 5 45.0                      | 6 52.5                      |
| 200.0                                  | 99.0                        | 98.4                        | 93.2                        | 0.0                         | 85.6                        | 83.9                        |
| 250.0                                  | 99.9                        | 100.2                       | 97.6                        | 0.0                         | 89.0                        | 87.5                        |
| 315.2                                  | 104.0                       | 102.2                       | 100.2                       | 0.0                         | 92.9                        | 90.0                        |
| 400.0                                  | 106.9                       | 107.0                       | 103.8                       | 0.0                         | 97.0                        | 93.3                        |
| 500.0                                  | 110.0                       | 109.2                       | 106.7                       | 0.0                         | 100.2                       | 95.8                        |
| 630.0                                  | 108.5                       | 110.8                       | 110.4                       | 0.0                         | 103.1                       | 98.5                        |
| 800.0                                  | 112.3                       | 114.1                       | 113.2                       | 0.0                         | 106.9                       | 102.2                       |
| 1000.0                                 | 111.8                       | 114.4                       | 115.3                       | 0.0                         | 110.2                       | 104.9                       |
| 1250.0                                 | 113.4                       | 116.1                       | 117.7                       | 0.0                         | 113.3                       | 107.7                       |
| 1600.0                                 | 114.0                       | 116.8                       | 118.1                       | 0.0                         | 115.6                       | 110.1                       |
| 2000.0                                 | 114.4                       | 118.1                       | 119.4                       | 0.0                         | 117.5                       | 111.9                       |
| 2500.0                                 | 115.5                       | 118.8                       | 119.9                       | 0.0                         | 118.1                       | 112.7                       |
| 3150.0                                 | 116.2                       | 119.9                       | 120.7                       | 0.0                         | 118.1                       | 113.0                       |
| 4000.0                                 | 116.5                       | 120.1                       | 121.4                       | 0.0                         | 117.7                       | 113.0                       |
| 5000.0                                 | 115.7                       | 119.6                       | 120.5                       | 0.0                         | 116.5                       | 112.9                       |
| 6300.0                                 | 114.6                       | 118.5                       | 119.7                       | 0.0                         | 115.3                       | 112.8                       |
| 8000.0                                 | 113.2                       | 116.9                       | 118.1                       | 0.0                         | 114.4                       | 112.2                       |
| 10000.0                                | 111.9                       | 115.5                       | 116.7                       | 0.0                         | 113.7                       | 111.9                       |
| 12500.0                                | 110.7                       | 114.0                       | 115.5                       | 0.0                         | 112.8                       | 111.3                       |
| 16000.0                                | 108.7                       | 112.5                       | 113.9                       | 0.0                         | 111.6                       | 110.4                       |
| 20000.0                                | 107.2                       | 111.2                       | 112.9                       | 0.0                         | 110.3                       | 109.9                       |
| 25000.0                                | 105.7                       | 110.3                       | 111.9                       | 0.0                         | 109.4                       | 109.5                       |
| 31500.0                                | 104.2                       | 109.4                       | 110.9                       | 0.0                         | 108.5                       | 108.7                       |
| 40000.0                                | 103.4                       | 109.1                       | 110.1                       | 0.0                         | 107.6                       | 108.6                       |
| OVERALL<br>SPL                         | 125.9                       | 129.2                       | 130.3                       | 125.3                       | 127.1                       | 123.5                       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE      | MICRO<br>PHONE       | MICRO<br>PHONE       | MICRO<br>PHONE       |
|-------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| FREQ.<br>HZ             | NO. 7<br>ANGLE 60.0 | NO. 8<br>ANGLE 67.5 | NO. 9<br>ANGLE 75.0 | NO. 10<br>ANGLE 82.5 | NO. 11<br>ANGLE 90.0 | NO. 12<br>ANGLE 97.5 |
| 200.0                   | 80.6                | 81.5                | 81.0                | 80.1                 | 79.8                 | 79.5                 |
| 250.0                   | 83.8                | 82.8                | 81.4                | 81.7                 | 81.8                 | 80.7                 |
| 315.2                   | 86.0                | 84.5                | 85.0                | 85.2                 | 83.1                 | 82.7                 |
| 400.0                   | 89.5                | 87.5                | 87.7                | 86.8                 | 86.2                 | 85.4                 |
| 500.0                   | 90.9                | 89.5                | 89.0                | 87.8                 | 86.5                 | 86.5                 |
| 630.0                   | 94.1                | 92.8                | 91.3                | 90.5                 | 89.9                 | 88.7                 |
| 800.0                   | 97.0                | 94.1                | 93.2                | 92.4                 | 91.9                 | 91.5                 |
| 1000.0                  | 99.4                | 96.6                | 95.7                | 93.9                 | 93.1                 | 92.8                 |
| 1250.0                  | 101.9               | 98.7                | 97.4                | 96.0                 | 95.0                 | 94.9                 |
| 1600.0                  | 104.0               | 100.3               | 98.8                | 97.2                 | 96.4                 | 96.0                 |
| 2000.0                  | 106.1               | 102.1               | 100.4               | 98.6                 | 98.0                 | 97.5                 |
| 2500.0                  | 107.0               | 102.9               | 101.4               | 99.8                 | 99.1                 | 98.4                 |
| 3150.0                  | 108.2               | 104.0               | 102.6               | 100.8                | 100.2                | 99.6                 |
| 4000.0                  | 109.3               | 105.7               | 103.7               | 101.7                | 100.9                | 100.5                |
| 5000.0                  | 110.0               | 106.1               | 104.1               | 102.4                | 101.7                | 101.5                |
| 6300.0                  | 110.5               | 106.8               | 104.7               | 103.0                | 102.7                | 102.9                |
| 8000.0                  | 110.3               | 106.9               | 105.2               | 103.4                | 103.3                | 103.5                |
| 10000.0                 | 110.4               | 107.0               | 105.3               | 103.9                | 103.7                | 104.2                |
| 12500.0                 | 110.2               | 107.2               | 105.7               | 104.2                | 104.0                | 104.6                |
| 16000.0                 | 109.7               | 106.9               | 105.6               | 103.9                | 103.9                | 104.1                |
| 20000.0                 | 109.2               | 106.5               | 105.5               | 103.5                | 103.5                | 103.2                |
| 25000.0                 | 108.5               | 106.0               | 105.4               | 103.2                | 103.1                | 102.5                |
| 31500.0                 | 107.4               | 105.4               | 105.1               | 102.6                | 102.4                | 101.4                |
| 40000.0                 | 106.5               | 105.2               | 104.4               | 101.9                | 102.1                | 100.5                |
| OVERALL<br>SPL          | 120.7               | 117.5               | 116.2               | 114.3                | 114.1                | 113.9                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.30 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 360.00 DEG.F, CHAMBER TEMPERATURE = 56.00 DEG.F  
RELATIVE HUMIDITY = 46.0 PERCENT  
GAMMA = 1.387

RUN NUMBER 182

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.078$   
TEMPERATURE RATIO  $TR = 1.589$   
MACH NUMBER  $MJ = 1.380$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.161$   
JET DENSITY RATIO  $DJ/D0 = 0.861$   
JET VELOCITY RATIO  $VJ/A0 = 1.487$   
JET VELOCITY  $VJ = 1655.8$  FPS

$TR/TJ = 1.368$   
 $DR/D0 = 1.937$   
 $DR/DJ = 2.249$   
MASS FLOW = 2.345 POUNDS PER SECOND  
THRUST = 122.74 POUNDS

SHOCK CELL LENGTH  $S = 2.092$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 76.1                                   | 77.8                                   | 78.9                                   | 78.5                                    | 76.9                                    | 75.6                                    |
| 250.0                                  | 79.6                                   | 79.5                                   | 78.8                                   | 77.5                                    | 76.8                                    | 74.9                                    |
| 315.2                                  | 79.9                                   | 80.1                                   | 79.0                                   | 78.3                                    | 78.2                                    | 76.9                                    |
| 400.0                                  | 83.0                                   | 83.2                                   | 82.3                                   | 82.1                                    | 82.2                                    | 82.4                                    |
| 500.0                                  | 86.1                                   | 85.4                                   | 85.4                                   | 85.9                                    | 85.8                                    | 85.8                                    |
| 630.0                                  | 88.0                                   | 87.9                                   | 87.8                                   | 88.4                                    | 88.8                                    | 89.2                                    |
| 800.0                                  | 90.1                                   | 90.2                                   | 89.9                                   | 89.2                                    | 89.0                                    | 89.0                                    |
| 1000.0                                 | 92.2                                   | 92.3                                   | 91.3                                   | 90.3                                    | 89.4                                    | 89.5                                    |
| 1250.0                                 | 94.9                                   | 94.7                                   | 93.1                                   | 92.8                                    | 91.8                                    | 91.7                                    |
| 1600.0                                 | 96.7                                   | 95.7                                   | 94.3                                   | 93.8                                    | 93.0                                    | 92.8                                    |
| 2000.0                                 | 98.5                                   | 97.1                                   | 96.0                                   | 95.3                                    | 94.0                                    | 93.9                                    |
| 2500.0                                 | 99.1                                   | 98.1                                   | 96.6                                   | 96.3                                    | 95.3                                    | 95.0                                    |
| 3150.0                                 | 99.9                                   | 99.2                                   | 97.8                                   | 97.6                                    | 96.6                                    | 96.5                                    |
| 4000.0                                 | 100.8                                  | 100.1                                  | 98.9                                   | 98.5                                    | 98.0                                    | 98.1                                    |
| 5000.0                                 | 101.1                                  | 100.7                                  | 100.2                                  | 99.5                                    | 100.3                                   | 100.3                                   |
| 6300.0                                 | 101.6                                  | 102.3                                  | 102.1                                  | 101.0                                   | 102.0                                   | 102.2                                   |
| 8000.0                                 | 102.3                                  | 103.7                                  | 102.2                                  | 101.4                                   | 102.3                                   | 102.1                                   |
| 10000.0                                | 103.2                                  | 104.4                                  | 102.1                                  | 101.8                                   | 102.4                                   | 102.3                                   |
| 12500.0                                | 103.9                                  | 103.8                                  | 102.9                                  | 102.0                                   | 102.4                                   | 101.9                                   |
| 16000.0                                | 103.3                                  | 103.5                                  | 102.2                                  | 101.5                                   | 101.7                                   | 101.3                                   |
| 20000.0                                | 102.2                                  | 103.9                                  | 102.1                                  | 101.1                                   | 100.9                                   | 100.6                                   |
| 25000.0                                | 102.5                                  | 103.6                                  | 102.0                                  | 101.0                                   | 100.6                                   | 100.5                                   |
| 31500.0                                | 102.2                                  | 103.7                                  | 101.9                                  | 100.5                                   | 100.1                                   | 100.2                                   |
| 40000.0                                | 101.4                                  | 103.7                                  | 101.6                                  | 100.3                                   | 99.2                                    | 100.0                                   |
| OVERALL<br>SPL                         | 113.5                                  | 114.2                                  | 112.7                                  | 111.9                                   | 112.0                                   | 111.9                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 83.0                                    | 71.8                                    | 72.6                                    | 73.5                                    |
| 250.0                                  | 74.8                                    | 74.8                                    | 75.8                                    | 75.9                                    |
| 315.2                                  | 77.3                                    | 76.6                                    | 76.9                                    | 78.1                                    |
| 400.0                                  | 81.0                                    | 79.7                                    | 78.8                                    | 79.8                                    |
| 500.0                                  | 85.5                                    | 84.5                                    | 82.9                                    | 81.7                                    |
| 630.0                                  | 89.6                                    | 88.9                                    | 86.2                                    | 81.8                                    |
| 800.0                                  | 88.6                                    | 88.2                                    | 87.2                                    | 85.0                                    |
| 1000.0                                 | 89.8                                    | 88.2                                    | 87.4                                    | 86.0                                    |
| 1250.0                                 | 91.2                                    | 90.8                                    | 90.4                                    | 88.5                                    |
| 1600.0                                 | 91.9                                    | 91.4                                    | 91.5                                    | 90.7                                    |
| 2000.0                                 | 93.4                                    | 93.2                                    | 93.0                                    | 91.4                                    |
| 2500.0                                 | 94.3                                    | 94.3                                    | 94.5                                    | 93.4                                    |
| 3150.0                                 | 95.7                                    | 96.0                                    | 96.1                                    | 95.3                                    |
| 4000.0                                 | 97.9                                    | 98.5                                    | 99.6                                    | 99.1                                    |
| 5000.0                                 | 99.9                                    | 100.3                                   | 100.7                                   | 101.1                                   |
| 6300.0                                 | 101.2                                   | 101.6                                   | 101.4                                   | 101.7                                   |
| 8000.0                                 | 101.6                                   | 102.1                                   | 101.2                                   | 101.1                                   |
| 10000.0                                | 101.7                                   | 101.2                                   | 100.3                                   | 99.8                                    |
| 12500.0                                | 101.1                                   | 100.5                                   | 99.3                                    | 98.5                                    |
| 16000.0                                | 100.5                                   | 99.8                                    | 98.7                                    | 96.8                                    |
| 20000.0                                | 99.6                                    | 98.7                                    | 97.5                                    | 95.4                                    |
| 25000.0                                | 99.2                                    | 98.2                                    | 97.2                                    | 94.4                                    |
| 31500.0                                | 98.6                                    | 97.6                                    | 96.4                                    | 93.1                                    |
| 40000.0                                | 97.9                                    | 97.4                                    | 95.4                                    | 91.9                                    |
| OVERALL<br>SPL                         | 111.1                                   | 110.8                                   | 110.3                                   | 109.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.00 PSI, ATMOSPHERIC PRESSURE = 14.26 PSI  
RESERVOIR TEMPERATURE = 550.00 DEG.F, CHAMBER TEMPERATURE = 81.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.377

RUN NUMBER 76

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.034$   
TEMPERATURE RATIO  $TR = 1.867$   
MACH NUMBER  $MJ = 1.372$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.378$   
JET DENSITY RATIO  $DJ/D_0 = 0.726$   
JET VELOCITY RATIO  $VJ/A_0 = 1.611$   
JET VELOCITY  $VJ = 1836.7$  FPS

$TR/TJ = 1.355$   
 $DR/D_0 = 1.625$   
 $DR/DJ = 2.239$   
MASS FLOW = 2.141 POUNDS PER SECOND  
THRUST = 121.41 POUNDS

SHOCK CELL LENGTH  $S = 2.068$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 98.8                                  | 98.0                                  | 93.6                                  | 10.0                                  | 10.0                                  | 82.9                                  |
| 250.0                                  | 102.2                                 | 101.3                                 | 98.7                                  | 95.4                                  | 92.9                                  | 86.9                                  |
| 315.2                                  | 105.4                                 | 103.1                                 | 101.7                                 | 98.0                                  | 94.8                                  | 90.8                                  |
| 400.0                                  | 108.1                                 | 107.7                                 | 104.2                                 | 102.2                                 | 98.6                                  | 94.4                                  |
| 500.0                                  | 110.6                                 | 109.3                                 | 108.3                                 | 104.8                                 | 101.0                                 | 97.0                                  |
| 630.0                                  | 110.9                                 | 111.8                                 | 111.7                                 | 108.4                                 | 105.0                                 | 100.1                                 |
| 800.0                                  | 113.1                                 | 114.9                                 | 114.5                                 | 111.5                                 | 108.8                                 | 103.2                                 |
| 1000.0                                 | 113.3                                 | 115.3                                 | 116.5                                 | 114.7                                 | 112.1                                 | 106.8                                 |
| 1250.0                                 | 114.4                                 | 116.9                                 | 118.8                                 | 117.7                                 | 115.4                                 | 110.1                                 |
| 1600.0                                 | 114.8                                 | 117.8                                 | 119.2                                 | 118.6                                 | 117.0                                 | 112.2                                 |
| 2000.0                                 | 116.0                                 | 119.2                                 | 120.3                                 | 120.0                                 | 119.3                                 | 114.2                                 |
| 2500.0                                 | 116.8                                 | 120.2                                 | 121.1                                 | 120.5                                 | 119.9                                 | 114.8                                 |
| 3150.0                                 | 117.3                                 | 121.2                                 | 122.2                                 | 121.6                                 | 120.5                                 | 115.2                                 |
| 4000.0                                 | 117.5                                 | 121.5                                 | 122.6                                 | 122.2                                 | 120.6                                 | 114.9                                 |
| 5000.0                                 | 116.8                                 | 120.3                                 | 121.6                                 | 121.6                                 | 120.1                                 | 114.7                                 |
| 6300.0                                 | 115.3                                 | 118.8                                 | 119.9                                 | 120.3                                 | 118.9                                 | 114.3                                 |
| 8000.0                                 | 113.7                                 | 117.1                                 | 118.0                                 | 118.8                                 | 117.4                                 | 113.3                                 |
| 10000.0                                | 112.1                                 | 115.6                                 | 116.4                                 | 117.3                                 | 116.1                                 | 112.8                                 |
| 12500.0                                | 110.8                                 | 114.3                                 | 115.0                                 | 116.1                                 | 115.3                                 | 112.2                                 |
| 16000.0                                | 109.3                                 | 113.1                                 | 113.8                                 | 114.8                                 | 114.0                                 | 111.5                                 |
| 20000.0                                | 107.6                                 | 111.7                                 | 112.8                                 | 113.6                                 | 112.6                                 | 110.9                                 |
| 25000.0                                | 106.2                                 | 110.6                                 | 111.9                                 | 112.6                                 | 111.7                                 | 110.4                                 |
| 31500.0                                | 104.3                                 | 109.6                                 | 111.1                                 | 111.6                                 | 110.8                                 | 109.7                                 |
| 40000.0                                | 103.6                                 | 109.1                                 | 110.8                                 | 111.2                                 | 109.9                                 | 109.5                                 |
| OVERALL<br>SPL                         | 126.9                                 | 130.1                                 | 131.2                                 | 130.9                                 | 129.6                                 | 125.1                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  |
|         | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
| 200.0   | 81.9  |       | 82.4  |       | 81.9  |       |
| 250.0   | 85.0  |       | 83.3  |       | 80.6  |       |
| 315.2   | 87.4  |       | 86.1  |       | 82.3  |       |
| 400.0   | 90.5  |       | 88.5  |       | 85.8  |       |
| 500.0   | 92.4  |       | 90.1  |       | 87.5  |       |
| 630.0   | 96.3  |       | 93.4  |       | 88.4  |       |
| 800.0   | 99.3  |       | 95.8  |       | 91.6  |       |
| 1000.0  | 102.0 |       | 97.9  |       | 93.4  |       |
| 1250.0  | 104.7 |       | 99.9  |       | 95.0  |       |
| 1600.0  | 106.9 |       | 101.7 |       | 97.1  |       |
| 2000.0  | 108.7 |       | 103.9 |       | 98.3  |       |
| 2500.0  | 109.9 |       | 105.1 |       | 99.8  |       |
| 3150.0  | 111.1 |       | 106.2 |       | 101.0 |       |
| 4000.0  | 111.7 |       | 107.6 |       | 102.2 |       |
| 5000.0  | 112.5 |       | 108.4 |       | 103.1 |       |
| 6300.0  | 112.6 |       | 108.9 |       | 104.0 |       |
| 8000.0  | 112.2 |       | 108.9 |       | 104.7 |       |
| 10000.0 | 112.1 |       | 109.0 |       | 105.0 |       |
| 12500.0 | 111.9 |       | 109.1 |       | 105.6 |       |
| 16000.0 | 111.2 |       | 109.0 |       | 105.7 |       |
| 20000.0 | 110.6 |       | 108.4 |       | 105.5 |       |
| 25000.0 | 109.8 |       | 107.8 |       | 105.2 |       |
| 31500.0 | 108.8 |       | 107.1 |       | 104.8 |       |
| 40000.0 | 108.1 |       | 106.9 |       | 103.9 |       |
|         |       |       |       |       | 103.1 |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 122.8 |       | 119.5 |       | 115.8 |       |
|         |       |       |       |       | 115.1 |       |
|         |       |       |       |       |       | 114.7 |



SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 29.10 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 500.00 DEG.F, CHAMBER TEMPERATURE = 55.00 DEG.F  
RELATIVE HUMIDITY = 46.0 PERCENT  
GAMMA = 1.377

RUN NUMBER 183

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $Pr = 3.064$   
TEMPERATURE RATIO  $Tr = 1.864$   
MACH NUMBER  $MJ = 1.380$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.372$   
JET DENSITY RATIO  $DJ/D0 = 0.729$   
JET VELOCITY RATIO  $VJ/A0 = 1.616$   
JET VELOCITY  $VJ = 1797.4$  FPS

$Tr/TJ = 1.359$   
 $Dr/D0 = 1.644$   
 $Dr/LJ = 2.255$   
MASS FLOW = 2.156 POUNDS PER SECOND  
THRUST = 122.66 POUNDS

SHOCK CELL LENGTH  $S = 2.091$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 77.7                                   | 79.5                                   | 79.3                                   | 79.3                                    | 77.8                                    | 75.5                                    |
| 250.0                                  | 80.3                                   | 80.9                                   | 79.7                                   | 78.0                                    | 77.0                                    | 75.9                                    |
| 315.2                                  | 81.5                                   | 81.5                                   | 80.3                                   | 79.4                                    | 79.4                                    | 79.6                                    |
| 400.0                                  | 85.0                                   | 84.7                                   | 83.9                                   | 83.5                                    | 83.6                                    | 84.0                                    |
| 500.0                                  | 87.9                                   | 87.3                                   | 86.6                                   | 87.1                                    | 87.1                                    | 87.0                                    |
| 630.0                                  | 89.9                                   | 89.2                                   | 89.5                                   | 90.0                                    | 90.1                                    | 91.0                                    |
| 800.0                                  | 92.1                                   | 91.9                                   | 91.0                                   | 90.1                                    | 90.8                                    | 91.0                                    |
| 1000.0                                 | 94.4                                   | 94.2                                   | 92.4                                   | 91.6                                    | 91.0                                    | 91.2                                    |
| 1250.0                                 | 97.2                                   | 96.2                                   | 94.5                                   | 93.8                                    | 93.4                                    | 93.4                                    |
| 1600.0                                 | 98.7                                   | 97.6                                   | 95.9                                   | 95.2                                    | 94.7                                    | 94.5                                    |
| 2000.0                                 | 100.4                                  | 98.8                                   | 97.6                                   | 96.8                                    | 96.2                                    | 95.6                                    |
| 2500.0                                 | 101.3                                  | 99.7                                   | 98.5                                   | 97.9                                    | 97.3                                    | 96.5                                    |
| 3150.0                                 | 102.4                                  | 100.8                                  | 99.9                                   | 99.3                                    | 98.6                                    | 98.0                                    |
| 4000.0                                 | 103.1                                  | 101.7                                  | 100.8                                  | 100.2                                   | 100.0                                   | 99.7                                    |
| 5000.0                                 | 103.5                                  | 102.1                                  | 102.1                                  | 101.5                                   | 101.7                                   | 102.1                                   |
| 6300.0                                 | 104.2                                  | 103.6                                  | 103.4                                  | 103.3                                   | 103.2                                   | 103.7                                   |
| 8000.0                                 | 105.0                                  | 104.9                                  | 103.7                                  | 103.6                                   | 103.4                                   | 103.5                                   |
| 10000.0                                | 106.0                                  | 105.5                                  | 103.7                                  | 103.7                                   | 103.5                                   | 103.5                                   |
| 12500.0                                | 106.5                                  | 105.1                                  | 104.3                                  | 103.6                                   | 103.5                                   | 103.0                                   |
| 16000.0                                | 105.7                                  | 104.5                                  | 103.5                                  | 103.1                                   | 102.8                                   | 102.3                                   |
| 20000.0                                | 104.5                                  | 105.2                                  | 103.5                                  | 102.4                                   | 101.9                                   | 101.4                                   |
| 25000.0                                | 104.6                                  | 104.6                                  | 103.3                                  | 102.1                                   | 101.6                                   | 101.3                                   |
| 31500.0                                | 104.3                                  | 104.7                                  | 103.1                                  | 101.6                                   | 101.1                                   | 101.0                                   |
| 40000.0                                | 103.4                                  | 104.7                                  | 102.8                                  | 101.4                                   | 100.0                                   | 101.0                                   |
| OVERALL<br>SPL                         | 115.9                                  | 115.4                                  | 114.2                                  | 113.6                                   | 113.2                                   | 113.2                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 74.6  |       | 73.4  |       | 75.2  |       | 75.4  |  |
| 250.0   |       | 76.7  |       | 76.8  |       | 77.7  |       | 78.3  |  |
| 315.2   |       | 79.2  |       | 78.2  |       | 78.6  |       | 79.3  |  |
| 400.0   |       | 82.6  |       | 81.0  |       | 80.1  |       | 81.0  |  |
| 500.0   |       | 87.0  |       | 86.2  |       | 85.2  |       | 83.4  |  |
| 630.0   |       | 91.5  |       | 90.5  |       | 87.8  |       | 83.3  |  |
| 800.0   |       | 90.4  |       | 89.6  |       | 88.6  |       | 86.1  |  |
| 1000.0  |       | 91.5  |       | 89.3  |       | 88.2  |       | 87.0  |  |
| 1250.0  |       | 92.6  |       | 92.3  |       | 92.1  |       | 89.5  |  |
| 1600.0  |       | 93.2  |       | 93.1  |       | 93.0  |       | 91.8  |  |
| 2000.0  |       | 94.7  |       | 95.1  |       | 94.4  |       | 92.6  |  |
| 2500.0  |       | 95.9  |       | 95.9  |       | 95.5  |       | 94.4  |  |
| 3150.0  |       | 97.5  |       | 97.7  |       | 97.4  |       | 96.4  |  |
| 4000.0  |       | 99.9  |       | 100.7 |       | 100.9 |       | 100.0 |  |
| 5000.0  |       | 102.2 |       | 102.5 |       | 101.9 |       | 102.1 |  |
| 6300.0  |       | 103.4 |       | 103.7 |       | 102.4 |       | 102.8 |  |
| 8000.0  |       | 103.5 |       | 103.8 |       | 102.1 |       | 101.9 |  |
| 10000.0 |       | 103.3 |       | 102.6 |       | 101.2 |       | 100.4 |  |
| 12500.0 |       | 102.5 |       | 102.0 |       | 99.9  |       | 99.2  |  |
| 16000.0 |       | 101.5 |       | 100.8 |       | 98.9  |       | 97.5  |  |
| 20000.0 |       | 100.7 |       | 99.6  |       | 97.6  |       | 95.9  |  |
| 25000.0 |       | 100.2 |       | 98.9  |       | 97.2  |       | 95.0  |  |
| 31500.0 |       | 99.4  |       | 98.2  |       | 96.5  |       | 93.8  |  |
| 40000.0 |       | 98.8  |       | 98.0  |       | 95.5  |       | 92.6  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 112.6 |       | 112.4 |       | 111.1 |       | 110.4 |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 28.85 PSI, ATMOSPHERIC PRESSURE = 14.26 PSI  
RESERVOIR TEMPERATURE = 840.00 DEG.F, CHAMBER TEMPERATURE = 81.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.361

RUN NUMBER 77

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.023$   
TEMPERATURE RATIO  $TR = 2.403$   
MACH NUMBER  $MJ = 1.375$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.792$   
JET DENSITY RATIO  $DJ/D0 = 0.558$   
JET VELOCITY RATIO  $VJ/A0 = 1.840$   
JET VELOCITY  $VJ = 2097.8$  FPS

$TR/TJ = 1.341$   
 $DR/D0 = 1.258$   
 $DR/DJ = 2.254$   
MASS FLOW = 1.880 POUNDS PER SECOND  
THRUST = 121.78 POUNDS

SHOCK CELL LENGTH  $S = 2.075$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 101.0                                 | 99.6                                  | 93.7                                  | 90.2                                  | 20.0                                  | 10.0                                  |
| 250.0                                  | 103.5                                 | 102.8                                 | 100.4                                 | 96.1                                  | 93.7                                  | 90.9                                  |
| 315.2                                  | 108.4                                 | 105.8                                 | 104.5                                 | 100.6                                 | 96.6                                  | 93.3                                  |
| 400.0                                  | 110.7                                 | 110.3                                 | 107.5                                 | 104.0                                 | 101.4                                 | 96.6                                  |
| 500.0                                  | 113.5                                 | 112.2                                 | 111.0                                 | 107.5                                 | 104.4                                 | 99.3                                  |
| 630.0                                  | 112.0                                 | 114.3                                 | 115.3                                 | 111.5                                 | 108.6                                 | 103.0                                 |
| 800.0                                  | 114.9                                 | 116.8                                 | 117.4                                 | 114.7                                 | 112.3                                 | 107.0                                 |
| 1000.0                                 | 114.2                                 | 116.6                                 | 119.5                                 | 117.5                                 | 115.0                                 | 110.3                                 |
| 1250.0                                 | 115.6                                 | 118.3                                 | 121.0                                 | 120.1                                 | 118.6                                 | 113.4                                 |
| 1600.0                                 | 115.6                                 | 118.8                                 | 121.2                                 | 121.0                                 | 120.2                                 | 116.0                                 |
| 2000.0                                 | 116.4                                 | 119.9                                 | 122.5                                 | 122.1                                 | 122.4                                 | 117.9                                 |
| 2500.0                                 | 116.9                                 | 120.5                                 | 122.8                                 | 122.8                                 | 122.9                                 | 119.2                                 |
| 3150.0                                 | 117.0                                 | 120.8                                 | 123.6                                 | 123.9                                 | 123.9                                 | 119.9                                 |
| 4000.0                                 | 116.0                                 | 120.5                                 | 123.9                                 | 124.0                                 | 124.4                                 | 119.7                                 |
| 5000.0                                 | 113.9                                 | 118.9                                 | 122.3                                 | 123.2                                 | 124.2                                 | 119.5                                 |
| 6300.0                                 | 112.0                                 | 116.8                                 | 120.5                                 | 121.8                                 | 123.6                                 | 118.2                                 |
| 8000.0                                 | 109.8                                 | 115.0                                 | 119.3                                 | 120.6                                 | 122.4                                 | 117.0                                 |
| 10000.0                                | 108.2                                 | 113.6                                 | 117.7                                 | 120.8                                 | 122.0                                 | 116.1                                 |
| 12500.0                                | 106.7                                 | 112.3                                 | 117.3                                 | 118.7                                 | 120.7                                 | 115.3                                 |
| 16000.0                                | 104.9                                 | 110.8                                 | 115.8                                 | 117.6                                 | 119.9                                 | 114.4                                 |
| 20000.0                                | 103.1                                 | 109.7                                 | 115.0                                 | 116.9                                 | 118.9                                 | 113.7                                 |
| 25000.0                                | 101.4                                 | 108.8                                 | 114.4                                 | 116.2                                 | 118.1                                 | 113.1                                 |
| 31500.0                                | 99.3                                  | 107.6                                 | 113.6                                 | 115.4                                 | 117.6                                 | 112.2                                 |
| 40000.0                                | 98.8                                  | 107.3                                 | 113.1                                 | 115.4                                 | 117.0                                 | 112.0                                 |
| OVERALL<br>SPL                         | 126.5                                 | 129.9                                 | 132.8                                 | 133.2                                 | 133.8                                 | 129.0                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 83.4                                  | 84.1                                  | 83.2                                  | 83.7                                   | 81.9                                   | 81.0                                   |
| 250.0                                  | 86.9                                  | 85.4                                  | 84.2                                  | 84.4                                   | 83.9                                   | 83.6                                   |
| 315.2                                  | 89.0                                  | 88.3                                  | 87.4                                  | 87.0                                   | 86.2                                   | 85.6                                   |
| 400.0                                  | 93.2                                  | 91.0                                  | 90.1                                  | 89.3                                   | 89.3                                   | 88.0                                   |
| 500.0                                  | 95.2                                  | 91.8                                  | 90.6                                  | 90.2                                   | 89.2                                   | 89.5                                   |
| 630.0                                  | 99.2                                  | 95.2                                  | 93.2                                  | 92.9                                   | 91.7                                   | 90.7                                   |
| 800.0                                  | 101.9                                 | 97.7                                  | 95.9                                  | 95.0                                   | 94.3                                   | 93.7                                   |
| 1000.0                                 | 104.8                                 | 100.4                                 | 97.8                                  | 96.8                                   | 95.6                                   | 94.7                                   |
| 1250.0                                 | 107.7                                 | 102.6                                 | 99.7                                  | 98.3                                   | 97.4                                   | 97.2                                   |
| 1600.0                                 | 110.0                                 | 104.5                                 | 101.0                                 | 100.0                                  | 99.3                                   | 98.0                                   |
| 2000.0                                 | 112.0                                 | 106.7                                 | 103.1                                 | 101.2                                  | 100.4                                  | 99.1                                   |
| 2500.0                                 | 113.1                                 | 107.7                                 | 104.3                                 | 102.7                                  | 101.5                                  | 100.2                                  |
| 3150.0                                 | 114.1                                 | 109.1                                 | 105.7                                 | 104.2                                  | 102.8                                  | 101.6                                  |
| 4000.0                                 | 114.6                                 | 110.3                                 | 107.2                                 | 105.2                                  | 103.7                                  | 102.4                                  |
| 5000.0                                 | 115.0                                 | 111.3                                 | 107.8                                 | 105.9                                  | 104.5                                  | 103.5                                  |
| 6300.0                                 | 114.9                                 | 111.6                                 | 108.3                                 | 106.2                                  | 105.0                                  | 104.3                                  |
| 8000.0                                 | 114.6                                 | 111.8                                 | 108.5                                 | 106.2                                  | 105.4                                  | 104.7                                  |
| 10000.0                                | 114.6                                 | 111.8                                 | 108.4                                 | 106.5                                  | 105.8                                  | 105.3                                  |
| 12500.0                                | 114.3                                 | 111.6                                 | 108.7                                 | 106.8                                  | 106.0                                  | 105.5                                  |
| 16000.0                                | 113.5                                 | 111.3                                 | 108.7                                 | 106.6                                  | 106.2                                  | 105.3                                  |
| 20000.0                                | 112.8                                 | 110.8                                 | 108.4                                 | 106.1                                  | 105.7                                  | 104.7                                  |
| 25000.0                                | 111.9                                 | 110.2                                 | 108.2                                 | 105.6                                  | 105.4                                  | 104.0                                  |
| 31500.0                                | 110.9                                 | 109.2                                 | 107.5                                 | 104.8                                  | 104.7                                  | 103.0                                  |
| 40000.0                                | 110.0                                 | 108.8                                 | 106.7                                 | 103.9                                  | 104.3                                  | 102.1                                  |
| OVERALL<br>SPL                         | 125.3                                 | 122.1                                 | 119.2                                 | 117.1                                  | 116.4                                  | 115.4                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 28.90 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 774.00 DEG.F, CHAMBER TEMPERATURE = 55.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.361

RUN NUMBER 184

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 3.050$   
TEMPERATURE RATIO  $T_r = 2.396$   
MACH NUMBER  $M_J = 1.381$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 1.783$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 0.561$   
JET VELOCITY RATIO  $V_J/A_0 = 1.844$   
JET VELOCITY  $V_J = 2050.8$  FPS

$T_r/T_J = 1.344$   
 $D_r/D_0 = 1.273$   
 $D_r/D_J = 2.269$   
MASS FLOW = 1.893 POUNDS PER SECOND  
THRUST = 122.89 POUNDS

SHOCK CELL LENGTH  $S = 2.095$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 80.2                        | 80.8                        | 81.4                        | 82.1                        | 80.6                        | 76.9                        |
| 250.0                                  | 82.2                        | 82.8                        | 81.4                        | 80.2                        | 78.8                        | 77.7                        |
| 315.2                                  | 83.3                        | 83.4                        | 82.2                        | 81.0                        | 81.0                        | 81.3                        |
| 400.0                                  | 86.4                        | 85.9                        | 85.5                        | 85.2                        | 85.3                        | 85.6                        |
| 500.0                                  | 90.4                        | 88.7                        | 88.6                        | 89.2                        | 89.5                        | 89.0                        |
| 630.0                                  | 91.9                        | 90.8                        | 91.0                        | 92.1                        | 92.9                        | 93.4                        |
| 800.0                                  | 93.4                        | 93.4                        | 93.0                        | 92.3                        | 92.7                        | 93.6                        |
| 1000.0                                 | 96.1                        | 95.8                        | 94.2                        | 92.9                        | 92.2                        | 92.8                        |
| 1250.0                                 | 98.9                        | 98.3                        | 95.9                        | 95.5                        | 94.8                        | 94.7                        |
| 1600.0                                 | 100.4                       | 99.2                        | 97.1                        | 96.4                        | 96.3                        | 95.8                        |
| 2000.0                                 | 102.4                       | 100.6                       | 98.8                        | 98.4                        | 97.5                        | 96.9                        |
| 2500.0                                 | 103.2                       | 101.9                       | 99.9                        | 99.5                        | 98.7                        | 98.1                        |
| 3150.0                                 | 104.3                       | 103.1                       | 101.0                       | 101.1                       | 100.1                       | 99.5                        |
| 4000.0                                 | 104.9                       | 104.2                       | 102.1                       | 101.7                       | 101.2                       | 100.6                       |
| 5000.0                                 | 105.6                       | 104.9                       | 102.9                       | 102.5                       | 102.5                       | 102.3                       |
| 6300.0                                 | 106.1                       | 106.0                       | 104.1                       | 104.1                       | 103.9                       | 103.7                       |
| 8000.0                                 | 106.6                       | 107.0                       | 104.0                       | 104.1                       | 104.0                       | 103.4                       |
| 10000.0                                | 107.6                       | 107.9                       | 103.8                       | 104.4                       | 103.9                       | 103.6                       |
| 12500.0                                | 108.0                       | 107.4                       | 104.3                       | 104.3                       | 104.1                       | 103.3                       |
| 16000.0                                | 107.3                       | 106.6                       | 103.3                       | 104.0                       | 103.4                       | 102.6                       |
| 20000.0                                | 106.0                       | 107.0                       | 102.9                       | 103.3                       | 102.6                       | 102.1                       |
| 25000.0                                | 106.0                       | 106.7                       | 102.0                       | 103.0                       | 102.2                       | 101.7                       |
| 31500.0                                | 105.7                       | 106.6                       | 101.1                       | 102.7                       | 102.1                       | 101.8                       |
| 40000.0                                | 105.0                       | 106.8                       | 100.2                       | 102.8                       | 101.3                       | 101.9                       |
| OVERALL<br>SPL                         | 117.6                       | 117.6                       | 114.2                       | 114.6                       | 114.1                       | 113.7                       |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>16 127.5 | MICRO<br>PHONE<br>NO. ANGLE<br>17 135.0 | MICRO<br>PHONE<br>NO. ANGLE<br>18 142.5 | MICRO<br>PHONE<br>NO. ANGLE<br>19 150.0 |
|--|---|---|---|---|
| 200.0                                  | 76.1                                    | 75.0                                    | 76.3                                    | 77.3                                    |
| 250.0                                  | 78.0                                    | 77.7                                    | 79.3                                    | 80.2                                    |
| 315.2                                  | 81.0                                    | 80.3                                    | 81.0                                    | 82.3                                    |
| 400.0                                  | 84.4                                    | 82.4                                    | 82.5                                    | 83.5                                    |
| 500.0                                  | 88.9                                    | 87.9                                    | 87.0                                    | 85.4                                    |
| 630.0                                  | 93.9                                    | 92.4                                    | 90.1                                    | 85.3                                    |
| 800.0                                  | 92.9                                    | 92.1                                    | 90.7                                    | 87.8                                    |
| 1000.0                                 | 93.1                                    | 91.0                                    | 90.2                                    | 89.0                                    |
| 1250.0                                 | 93.7                                    | 93.5                                    | 93.4                                    | 91.3                                    |
| 1600.0                                 | 94.7                                    | 94.6                                    | 94.6                                    | 93.5                                    |
| 2000.0                                 | 96.4                                    | 97.0                                    | 96.4                                    | 94.2                                    |
| 2500.0                                 | 97.1                                    | 97.2                                    | 97.3                                    | 95.6                                    |
| 3150.0                                 | 98.8                                    | 98.6                                    | 98.8                                    | 97.6                                    |
| 4000.0                                 | 100.5                                   | 100.7                                   | 101.3                                   | 100.4                                   |
| 5000.0                                 | 102.3                                   | 102.2                                   | 102.5                                   | 102.2                                   |
| 6300.0                                 | 103.5                                   | 103.6                                   | 103.1                                   | 103.2                                   |
| 8000.0                                 | 103.6                                   | 103.6                                   | 102.6                                   | 102.2                                   |
| 10000.0                                | 103.6                                   | 102.8                                   | 102.0                                   | 100.8                                   |
| 12500.0                                | 102.8                                   | 102.1                                   | 100.8                                   | 99.7                                    |
| 16000.0                                | 102.1                                   | 101.0                                   | 99.9                                    | 97.9                                    |
| 20000.0                                | 101.4                                   | 100.2                                   | 98.8                                    | 96.5                                    |
| 25000.0                                | 100.9                                   | 99.2                                    | 98.1                                    | 95.2                                    |
| 31500.0                                | 100.4                                   | 98.8                                    | 97.8                                    | 94.3                                    |
| 40000.0                                | 100.1                                   | 98.8                                    | 97.1                                    | 93.5                                    |
| OVERALL<br>SPL                         | 113.2                                   | 112.7                                   | 112.0                                   | 110.9                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 28.20 PSI, ATMOSPHERIC PRESSURE = 14.26 PSI  
RESERVOIR TEMPERATURE = 1132.00 DEG.F, CHAMBER TEMPERATURE = 82.00 DEG.F  
RELATIVE HUMIDITY = 54.0 PERCENT  
GAMMA = 1.344

RUN NUMBER 78

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 2.978  
TEMPERATURE RATIO TR = 2.937  
MACH NUMBER MJ = 1.369  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.222  
JET DENSITY RATIO DJ/D0 = 0.450  
JET VELOCITY RATIO VJ/A0 = 2.040  
JET VELOCITY VJ = 2327.9 FPS

TR/TJ = 1.322  
DR/D0 = 1.014  
DR/DJ = 2.252  
MASS FLOW = 1.681 POUNDS PER SECOND  
THRUST = 120.73 POUNDS

SHOCK CELL LENGTH S = 2.056 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 100.2                                 | 99.0                                  | 94.7                                  | 20.0                                  | 20.0                                  | 20.0                                  |
| 250.0                                  | 102.5                                 | 102.5                                 | 100.0                                 | 95.7                                  | 93.4                                  | 90.9                                  |
| 315.2                                  | 107.7                                 | 105.0                                 | 104.4                                 | 99.6                                  | 96.3                                  | 93.2                                  |
| 400.0                                  | 109.3                                 | 109.6                                 | 107.2                                 | 102.9                                 | 101.3                                 | 96.4                                  |
| 500.0                                  | 112.3                                 | 111.8                                 | 110.4                                 | 106.8                                 | 103.4                                 | 99.0                                  |
| 630.0                                  | 110.9                                 | 113.5                                 | 114.1                                 | 110.1                                 | 107.6                                 | 103.1                                 |
| 800.0                                  | 113.6                                 | 116.2                                 | 116.6                                 | 113.5                                 | 111.3                                 | 106.3                                 |
| 1000.0                                 | 112.7                                 | 115.7                                 | 118.6                                 | 116.5                                 | 114.6                                 | 110.1                                 |
| 1250.0                                 | 113.9                                 | 116.7                                 | 120.0                                 | 119.0                                 | 117.8                                 | 113.5                                 |
| 1600.0                                 | 113.6                                 | 116.9                                 | 119.9                                 | 119.9                                 | 120.1                                 | 116.0                                 |
| 2000.0                                 | 113.6                                 | 117.6                                 | 120.8                                 | 120.7                                 | 122.0                                 | 118.6                                 |
| 2500.0                                 | 113.5                                 | 118.2                                 | 121.2                                 | 121.4                                 | 123.0                                 | 120.0                                 |
| 3150.0                                 | 112.7                                 | 117.8                                 | 121.6                                 | 122.4                                 | 123.7                                 | 121.4                                 |
| 4000.0                                 | 111.3                                 | 116.7                                 | 121.4                                 | 123.0                                 | 124.6                                 | 121.7                                 |
| 5000.0                                 | 109.9                                 | 115.3                                 | 119.9                                 | 122.0                                 | 124.7                                 | 121.9                                 |
| 6300.0                                 | 108.6                                 | 113.9                                 | 118.4                                 | 120.6                                 | 124.0                                 | 121.4                                 |
| 8000.0                                 | 107.2                                 | 112.6                                 | 117.0                                 | 119.4                                 | 122.9                                 | 120.4                                 |
| 10000.0                                | 106.3                                 | 111.3                                 | 115.7                                 | 118.3                                 | 121.7                                 | 119.7                                 |
| 12500.0                                | 105.1                                 | 110.2                                 | 114.7                                 | 117.2                                 | 121.0                                 | 119.1                                 |
| 16000.0                                | 103.8                                 | 109.1                                 | 113.3                                 | 116.1                                 | 120.0                                 | 118.4                                 |
| 20000.0                                | 102.5                                 | 107.7                                 | 112.0                                 | 115.3                                 | 119.0                                 | 117.6                                 |
| 25000.0                                | 101.3                                 | 106.9                                 | 111.0                                 | 114.4                                 | 118.4                                 | 117.3                                 |
| 31500.0                                | 99.6                                  | 105.6                                 | 109.6                                 | 113.4                                 | 117.9                                 | 116.9                                 |
| 40000.0                                | 99.1                                  | 105.5                                 | 108.4                                 | 113.2                                 | 117.4                                 | 117.1                                 |
| OVERALL<br>SPL                         | 124.0                                 | 127.7                                 | 131.0                                 | 131.8                                 | 133.9                                 | 131.5                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 84.8                                  | 85.2                                  | 83.2                                  | 82.2                                   | 81.8                                   | 81.7                                   |
| 250.0                                  | 87.2                                  | 86.3                                  | 83.9                                  | 83.5                                   | 83.3                                   | 83.6                                   |
| 315.2                                  | 89.5                                  | 87.7                                  | 85.7                                  | 86.2                                   | 86.1                                   | 84.8                                   |
| 400.0                                  | 92.9                                  | 90.6                                  | 89.3                                  | 88.8                                   | 88.4                                   | 87.6                                   |
| 500.0                                  | 95.3                                  | 92.2                                  | 89.5                                  | 88.4                                   | 88.8                                   | 88.6                                   |
| 630.0                                  | 98.7                                  | 95.0                                  | 93.3                                  | 91.9                                   | 91.0                                   | 90.4                                   |
| 800.0                                  | 101.6                                 | 97.6                                  | 95.3                                  | 94.1                                   | 93.5                                   | 93.1                                   |
| 1000.0                                 | 105.0                                 | 100.1                                 | 97.4                                  | 96.0                                   | 95.0                                   | 94.5                                   |
| 1250.0                                 | 108.0                                 | 102.4                                 | 99.4                                  | 97.8                                   | 97.1                                   | 96.8                                   |
| 1600.0                                 | 110.5                                 | 104.5                                 | 101.0                                 | 99.5                                   | 98.6                                   | 97.6                                   |
| 2000.0                                 | 112.8                                 | 106.9                                 | 103.0                                 | 101.2                                  | 99.9                                   | 99.4                                   |
| 2500.0                                 | 114.2                                 | 108.2                                 | 104.2                                 | 102.1                                  | 101.3                                  | 100.4                                  |
| 3150.0                                 | 115.6                                 | 109.6                                 | 105.5                                 | 103.9                                  | 102.4                                  | 102.1                                  |
| 4000.0                                 | 116.0                                 | 110.9                                 | 106.9                                 | 104.9                                  | 103.4                                  | 102.9                                  |
| 5000.0                                 | 116.6                                 | 112.2                                 | 107.8                                 | 105.8                                  | 104.2                                  | 104.0                                  |
| 6300.0                                 | 116.6                                 | 112.9                                 | 108.4                                 | 106.5                                  | 104.8                                  | 104.7                                  |
| 8000.0                                 | 116.1                                 | 113.2                                 | 108.7                                 | 106.6                                  | 105.0                                  | 105.0                                  |
| 10000.0                                | 116.0                                 | 113.5                                 | 108.7                                 | 107.5                                  | 105.6                                  | 105.8                                  |
| 12500.0                                | 115.6                                 | 113.5                                 | 109.0                                 | 107.2                                  | 105.9                                  | 105.9                                  |
| 16000.0                                | 114.8                                 | 113.3                                 | 109.1                                 | 107.0                                  | 106.1                                  | 105.8                                  |
| 20000.0                                | 114.0                                 | 112.7                                 | 109.0                                 | 106.6                                  | 105.6                                  | 105.1                                  |
| 25000.0                                | 113.3                                 | 112.1                                 | 108.6                                 | 106.1                                  | 105.0                                  | 104.5                                  |
| 31500.0                                | 112.4                                 | 111.3                                 | 107.9                                 | 105.1                                  | 104.3                                  | 103.4                                  |
| 40000.0                                | 111.6                                 | 110.8                                 | 107.1                                 | 104.1                                  | 103.7                                  | 102.3                                  |
| OVERALL<br>SPL                         | 126.6                                 | 123.5                                 | 119.4                                 | 117.3                                  | 116.1                                  | 115.7                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 28.60 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 1048.00 DEG.F, CHAMBER TEMPERATURE = 57.00 DEG.F  
RELATIVE HUMIDITY = 46.0 PERCENT  
GAMMA = 1.344

RUN NUMBER 185

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.028$   
TEMPERATURE RATIO  $TR = 2.917$   
MACH NUMBER  $MJ = 1.381$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 2.197$   
JET DENSITY RATIO  $DJ/D0 = 0.455$   
JET VELOCITY RATIO  $VJ/A0 = 2.046$   
JET VELOCITY  $VJ = 2280.8$  FPS

$TR/TJ = 1.328$   
 $DR/D0 = 1.038$   
 $DR/DJ = 2.281$   
MASS FLOW = 1.706 POUNDS PER SECOND  
THRUST = 122.88 POUNDS

SHOCK CELL LENGTH  $S = 2.095$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 10.0                        | 82.3                        | 93.1                        | 83.3                        | 81.2                        | 80.0                        |
| 250.0                                  | 83.2                        | 84.1                        | 83.3                        | 82.0                        | 81.3                        | 80.0                        |
| 315.2                                  | 84.0                        | 83.6                        | 82.3                        | 83.4                        | 83.5                        | 84.4                        |
| 400.0                                  | 87.2                        | 86.6                        | 86.2                        | 87.3                        | 87.4                        | 88.0                        |
| 500.0                                  | 90.7                        | 89.2                        | 89.0                        | 91.0                        | 91.4                        | 90.8                        |
| 630.0                                  | 93.3                        | 92.3                        | 92.1                        | 94.1                        | 94.7                        | 95.7                        |
| 800.0                                  | 95.3                        | 94.6                        | 94.4                        | 94.8                        | 95.0                        | 95.9                        |
| 1000.0                                 | 97.1                        | 96.8                        | 95.4                        | 95.4                        | 94.3                        | 94.8                        |
| 1250.0                                 | 100.1                       | 99.6                        | 97.4                        | 97.3                        | 96.8                        | 96.1                        |
| 1600.0                                 | 102.1                       | 100.4                       | 98.8                        | 98.5                        | 98.2                        | 97.6                        |
| 2000.0                                 | 103.9                       | 102.1                       | 100.6                       | 100.3                       | 99.3                        | 98.4                        |
| 2500.0                                 | 105.0                       | 103.2                       | 101.4                       | 101.4                       | 100.8                       | 99.7                        |
| 3150.0                                 | 106.1                       | 104.5                       | 102.8                       | 103.0                       | 101.8                       | 101.0                       |
| 4000.0                                 | 107.0                       | 105.5                       | 103.7                       | 103.7                       | 103.2                       | 101.9                       |
| 5000.0                                 | 107.5                       | 106.0                       | 104.5                       | 104.0                       | 103.9                       | 103.1                       |
| 6300.0                                 | 108.1                       | 107.4                       | 105.4                       | 105.0                       | 104.4                       | 104.2                       |
| 8000.0                                 | 108.7                       | 108.3                       | 105.4                       | 105.1                       | 104.6                       | 104.0                       |
| 10000.0                                | 109.5                       | 109.2                       | 105.0                       | 105.4                       | 104.6                       | 103.9                       |
| 12500.0                                | 110.2                       | 108.5                       | 105.9                       | 105.3                       | 104.8                       | 103.6                       |
| 16000.0                                | 109.7                       | 107.9                       | 105.0                       | 104.9                       | 104.2                       | 103.1                       |
| 20000.0                                | 108.5                       | 108.4                       | 104.8                       | 104.4                       | 103.4                       | 102.7                       |
| 25000.0                                | 108.4                       | 108.1                       | 104.2                       | 104.2                       | 103.3                       | 102.6                       |
| 31500.0                                | 108.0                       | 108.1                       | 103.3                       | 103.6                       | 102.9                       | 102.4                       |
| 40000.0                                | 107.1                       | 108.0                       | 102.4                       | 103.6                       | 102.0                       | 102.5                       |
| OVERALL<br>SPL                         | 119.7                       | 118.9                       | 115.9                       | 115.8                       | 115.1                       | 114.5                       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 77.2                        | 76.6                        | 0.0                         | 79.8                        |
| 250.0                                  | 79.7                        | 79.8                        | 0.0                         | 82.2                        |
| 315.2                                  | 83.8                        | 83.2                        | 0.0                         | 84.3                        |
| 400.0                                  | 86.8                        | 141.0                       | 0.0                         | 85.7                        |
| 500.0                                  | 91.3                        | 90.1                        | 0.0                         | 88.1                        |
| 630.0                                  | 96.7                        | 95.3                        | 0.0                         | 87.4                        |
| 800.0                                  | 96.2                        | 94.9                        | 0.0                         | 89.4                        |
| 1000.0                                 | 95.9                        | 92.8                        | 0.0                         | 91.3                        |
| 1250.0                                 | 95.4                        | 95.0                        | 0.0                         | 93.3                        |
| 1600.0                                 | 96.6                        | 96.7                        | 0.0                         | 95.0                        |
| 2000.0                                 | 98.1                        | 99.3                        | 0.0                         | 96.3                        |
| 2500.0                                 | 99.1                        | 0.0                         | 0.0                         | 97.7                        |
| 3150.0                                 | 100.8                       | 0.0                         | 0.0                         | 99.7                        |
| 4000.0                                 | 101.8                       | 0.0                         | 0.0                         | 101.4                       |
| 5000.0                                 | 102.8                       | 0.0                         | 0.0                         | 102.8                       |
| 6300.0                                 | 103.9                       | 0.0                         | 0.0                         | 103.2                       |
| 8000.0                                 | 104.0                       | 151.2                       | 0.0                         | 102.4                       |
| 10000.0                                | 103.8                       | 0.0                         | 0.0                         | 101.4                       |
| 12500.0                                | 103.4                       | 0.0                         | 0.0                         | 100.4                       |
| 16000.0                                | 102.9                       | 0.0                         | 0.0                         | 98.8                        |
| 20000.0                                | 102.3                       | 0.0                         | 0.0                         | 97.4                        |
| 25000.0                                | 101.9                       | 162.6                       | 0.0                         | 96.4                        |
| 31500.0                                | 101.5                       | 0.0                         | 0.0                         | 95.4                        |
| 40000.0                                | 101.1                       | 0.0                         | 0.0                         | 94.4                        |
| OVERALL<br>SPL                         | 114.1                       | 112.7                       | 112.0                       | 111.7                       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 27.90 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 1410.00 DEG.F, CHAMBER TEMPERATURE = 90.00 DEG.F  
RELATIVE HUMIDITY = 18.0 PERCENT  
GAMMA = 1.327

RUN NUMBER 111

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 2.965$   
TEMPERATURE RATIO  $TR = 3.400$   
MACH NUMBER  $MJ = 1.371$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 2.601$   
JET DENSITY RATIO  $\rho J/\rho 0 = 0.384$   
JET VELOCITY RATIO  $VJ/A0 = 2.210$   
JET VELOCITY  $VJ = 2541.0$  FPS

$TR/TJ = 1.307$   
 $DR/\rho 0 = 0.872$   
 $DR/DJ = 2.268$   
MASS FLOW = 1.556 POUNDS PER SECOND  
THRUST = 121.07 POUNDS

SHOCK CELL LENGTH  $S = 2.062$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 105.1 |       | 104.1 |       | 100.5 |       |
| 250.0   | 107.6 |       | 106.9 |       | 104.1 |       |
| 315.2   | 111.7 |       | 110.9 |       | 107.5 |       |
| 400.0   | 113.8 |       | 115.0 |       | 111.0 |       |
| 500.0   | 115.4 |       | 116.5 |       | 114.5 |       |
| 630.0   | 113.6 |       | 118.1 |       | 117.6 |       |
| 800.0   | 115.6 |       | 119.8 |       | 120.8 |       |
| 1000.0  | 115.0 |       | 119.4 |       | 123.1 |       |
| 1250.0  | 115.2 |       | 120.5 |       | 125.0 |       |
| 1600.0  | 114.9 |       | 120.6 |       | 124.9 |       |
| 2000.0  | 115.0 |       | 121.8 |       | 125.8 |       |
| 2500.0  | 115.0 |       | 122.4 |       | 126.2 |       |
| 3150.0  | 113.9 |       | 121.8 |       | 126.6 |       |
| 4000.0  | 112.7 |       | 120.6 |       | 126.2 |       |
| 5000.0  | 110.2 |       | 119.0 |       | 124.5 |       |
| 6300.0  | 108.4 |       | 117.3 |       | 123.0 |       |
| 8000.0  | 105.7 |       | 115.1 |       | 121.7 |       |
| 10000.0 | 103.9 |       | 113.3 |       | 120.5 |       |
| 12500.0 | 102.4 |       | 111.8 |       | 119.5 |       |
| 16000.0 | 100.7 |       | 110.2 |       | 118.2 |       |
| 20000.0 | 98.9  |       | 108.5 |       | 117.0 |       |
| 25000.0 | 97.0  |       | 107.0 |       | 116.2 |       |
| 31500.0 | 94.8  |       | 105.5 |       | 114.8 |       |
| 40000.0 | 93.2  |       | 104.4 |       | 114.0 |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 125.7 |       | 131.4 |       | 135.8 |       |
|         |       |       |       |       | 137.3 |       |
|         |       |       |       |       |       | 137.0 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |  |
| 200.0   | 91.2  |       | 10.0  |       | 89.9  |       | 89.0  |       | 88.5  |       | 87.2  |       |  |
| 250.0   | 93.9  |       | 90.5  |       | 88.8  |       | 89.3  |       | 89.5  |       | 88.6  |       |  |
| 315.2   | 94.7  |       | 91.6  |       | 90.9  |       | 91.5  |       | 90.1  |       | 89.0  |       |  |
| 400.0   | 98.7  |       | 94.5  |       | 93.4  |       | 92.8  |       | 93.6  |       | 92.3  |       |  |
| 500.0   | 101.5 |       | 95.0  |       | 94.7  |       | 94.4  |       | 93.0  |       | 92.5  |       |  |
| 630.0   | 104.6 |       | 99.6  |       | 97.7  |       | 96.8  |       | 95.4  |       | 94.4  |       |  |
| 800.0   | 107.7 |       | 102.3 |       | 100.1 |       | 98.7  |       | 97.4  |       | 97.0  |       |  |
| 1000.0  | 110.9 |       | 104.8 |       | 102.4 |       | 101.0 |       | 99.6  |       | 98.1  |       |  |
| 1250.0  | 114.9 |       | 108.3 |       | 104.7 |       | 102.5 |       | 101.0 |       | 100.2 |       |  |
| 1600.0  | 116.7 |       | 110.5 |       | 106.4 |       | 104.2 |       | 102.6 |       | 101.4 |       |  |
| 2000.0  | 119.8 |       | 112.1 |       | 108.8 |       | 106.1 |       | 104.2 |       | 103.4 |       |  |
| 2500.0  | 120.9 |       | 114.2 |       | 110.3 |       | 107.5 |       | 105.7 |       | 104.7 |       |  |
| 3150.0  | 122.5 |       | 115.3 |       | 112.0 |       | 109.0 |       | 106.8 |       | 105.9 |       |  |
| 4000.0  | 122.9 |       | 116.7 |       | 113.2 |       | 110.2 |       | 108.2 |       | 107.3 |       |  |
| 5000.0  | 122.4 |       | 117.1 |       | 113.9 |       | 110.6 |       | 108.4 |       | 107.6 |       |  |
| 6300.0  | 121.9 |       | 117.5 |       | 114.5 |       | 111.3 |       | 109.4 |       | 108.5 |       |  |
| 8000.0  | 120.7 |       | 117.3 |       | 114.3 |       | 111.3 |       | 109.4 |       | 108.5 |       |  |
| 10000.0 | 119.8 |       | 117.1 |       | 114.3 |       | 111.2 |       | 109.6 |       | 108.6 |       |  |
| 12500.0 | 118.6 |       | 116.5 |       | 114.0 |       | 110.9 |       | 109.1 |       | 108.5 |       |  |
| 16000.0 | 117.3 |       | 115.6 |       | 113.6 |       | 110.2 |       | 108.6 |       | 107.9 |       |  |
| 20000.0 | 115.9 |       | 114.2 |       | 112.8 |       | 109.4 |       | 107.8 |       | 107.0 |       |  |
| 25000.0 | 114.8 |       | 113.2 |       | 112.3 |       | 108.4 |       | 107.2 |       | 106.3 |       |  |
| 31500.0 | 113.7 |       | 112.2 |       | 111.3 |       | 107.1 |       | 106.4 |       | 105.3 |       |  |
| 40000.0 | 112.8 |       | 111.5 |       | 110.6 |       | 105.9 |       | 105.8 |       | 104.4 |       |  |
| OVERALL |       |       |       |       |       |       |       |       |       |       |       |       |  |
| SPL     | 131.7 |       | 127.2 |       | 124.5 |       | 121.3 |       | 119.6 |       | 118.7 |       |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.4 NOZZLE

RESERVOIR PRESSURE = 28.30 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 1360.00 DEG.F, CHAMBER TEMPERATURE = 47.00 DEG.F  
RELATIVE HUMIDITY = 40.0 PERCENT  
GAMMA = 1.327

RUN NUMBER 186

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 3.007$   
TEMPERATURE RATIO  $TR = 3.590$   
MACH NUMBER  $MJ = 1.361$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 2.737$   
JET DENSITY RATIO  $DJ/DO = 0.365$   
JET VELOCITY RATIO  $VJ/AO = 2.284$   
JET VELOCITY  $VJ = 2521.0$  FPS

$TR/TJ = 1.312$   
 $DR/DO = 0.838$   
 $DR/DJ = 2.293$   
MASS FLOW = 1.528 POUNDS PER SECOND  
THRUST = 122.87 POUNDS

SHOCK CELL LENGTH  $S = 2.094$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 10.0                                   | 82.5                                   | 83.1                                   | 83.3                                    | 82.9                                    | 80.9                                    |
| 250.0                                  | 83.6                                   | 84.8                                   | 83.9                                   | 82.7                                    | 81.6                                    | 80.3                                    |
| 315.2                                  | 84.2                                   | 84.5                                   | 83.1                                   | 83.8                                    | 84.4                                    | 83.9                                    |
| 400.0                                  | 87.0                                   | 87.0                                   | 85.9                                   | 87.7                                    | 87.8                                    | 89.0                                    |
| 500.0                                  | 91.4                                   | 90.1                                   | 89.9                                   | 91.4                                    | 91.6                                    | 91.7                                    |
| 630.0                                  | 92.8                                   | 92.3                                   | 92.3                                   | 94.4                                    | 95.7                                    | 96.1                                    |
| 800.0                                  | 95.5                                   | 94.8                                   | 95.1                                   | 95.2                                    | 96.1                                    | 97.1                                    |
| 1000.0                                 | 97.4                                   | 97.3                                   | 96.1                                   | 95.8                                    | 95.0                                    | 95.6                                    |
| 1250.0                                 | 100.9                                  | 100.1                                  | 98.0                                   | 98.0                                    | 97.6                                    | 96.9                                    |
| 1600.0                                 | 102.6                                  | 101.4                                  | 99.4                                   | 99.0                                    | 98.8                                    | 97.9                                    |
| 2000.0                                 | 104.4                                  | 103.0                                  | 101.1                                  | 101.0                                   | 99.9                                    | 98.8                                    |
| 2500.0                                 | 105.9                                  | 104.1                                  | 102.1                                  | 102.0                                   | 101.5                                   | 100.5                                   |
| 3150.0                                 | 106.9                                  | 105.2                                  | 103.7                                  | 103.7                                   | 102.6                                   | 102.0                                   |
| 4000.0                                 | 107.9                                  | 106.5                                  | 104.6                                  | 104.9                                   | 104.1                                   | 102.7                                   |
| 5000.0                                 | 108.5                                  | 107.4                                  | 105.6                                  | 105.1                                   | 105.4                                   | 103.9                                   |
| 6300.0                                 | 109.0                                  | 108.6                                  | 106.4                                  | 106.3                                   | 106.3                                   | 105.4                                   |
| 8000.0                                 | 109.7                                  | 109.6                                  | 106.3                                  | 106.9                                   | 106.8                                   | 105.5                                   |
| 10000.0                                | 110.5                                  | 110.8                                  | 106.5                                  | 107.2                                   | 106.6                                   | 105.2                                   |
| 12500.0                                | 111.2                                  | 109.7                                  | 106.8                                  | 107.1                                   | 106.7                                   | 105.3                                   |
| 16000.0                                | 110.6                                  | 109.3                                  | 106.1                                  | 106.8                                   | 106.1                                   | 104.9                                   |
| 20000.0                                | 109.5                                  | 109.9                                  | 106.1                                  | 106.3                                   | 105.4                                   | 104.5                                   |
| 25000.0                                | 109.7                                  | 109.8                                  | 105.7                                  | 106.2                                   | 105.4                                   | 104.6                                   |
| 31500.0                                | 109.2                                  | 110.1                                  | 104.9                                  | 105.7                                   | 105.0                                   | 104.4                                   |
| 40000.0                                | 108.5                                  | 110.1                                  | 103.9                                  | 105.7                                   | 104.2                                   | 104.5                                   |
| OVERALL<br>SPL                         | 120.6                                  | 120.3                                  | 117.0                                  | 117.4                                   | 116.8                                   | 115.9                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>16 127.5 | MICRO<br>PHONE<br>NO. ANGLE<br>17 135.0 | MICRO<br>PHONE<br>NO. ANGLE<br>18 142.5 | MICRO<br>PHONE<br>NO. ANGLE<br>19 150.0 |
|--|---|---|---|---|
| 200.0                                  | 78.3                                    | 77.0                                    | 78.2                                    | 79.9                                    |
| 250.0                                  | 80.4                                    | 81.3                                    | 81.6                                    | 83.6                                    |
| 315.2                                  | 84.1                                    | 84.4                                    | 84.9                                    | 85.7                                    |
| 400.0                                  | 87.3                                    | 85.9                                    | 85.2                                    | 87.0                                    |
| 500.0                                  | 91.2                                    | 91.0                                    | 89.9                                    | 89.5                                    |
| 630.0                                  | 96.4                                    | 95.8                                    | 93.2                                    | 88.9                                    |
| 800.0                                  | 97.4                                    | 96.6                                    | 94.6                                    | 90.0                                    |
| 1000.0                                 | 96.5                                    | 94.8                                    | 93.4                                    | 92.1                                    |
| 1250.0                                 | 95.8                                    | 95.6                                    | 95.4                                    | 93.9                                    |
| 1600.0                                 | 97.3                                    | 97.2                                    | 97.6                                    | 95.9                                    |
| 2000.0                                 | 99.1                                    | 100.0                                   | 100.1                                   | 96.7                                    |
| 2500.0                                 | 99.7                                    | 100.7                                   | 100.1                                   | 98.6                                    |
| 3150.0                                 | 101.4                                   | 101.3                                   | 101.2                                   | 101.0                                   |
| 4000.0                                 | 102.4                                   | 102.6                                   | 102.0                                   | 102.5                                   |
| 5000.0                                 | 103.3                                   | 102.9                                   | 102.7                                   | 104.1                                   |
| 6300.0                                 | 104.6                                   | 103.9                                   | 103.4                                   | 104.7                                   |
| 8000.0                                 | 105.0                                   | 104.3                                   | 103.5                                   | 104.3                                   |
| 10000.0                                | 105.1                                   | 104.0                                   | 103.2                                   | 103.8                                   |
| 12500.0                                | 104.9                                   | 104.2                                   | 102.5                                   | 102.4                                   |
| 16000.0                                | 104.6                                   | 103.6                                   | 102.1                                   | 100.9                                   |
| 20000.0                                | 104.0                                   | 102.8                                   | 101.3                                   | 99.5                                    |
| 25000.0                                | 103.8                                   | 102.5                                   | 100.9                                   | 98.6                                    |
| 31500.0                                | 103.3                                   | 102.1                                   | 100.5                                   | 97.6                                    |
| 40000.0                                | 103.0                                   | 102.2                                   | 99.8                                    | 96.6                                    |
| OVERALL<br>SPL                         | 115.3                                   | 114.6                                   | 113.7                                   | 113.4                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 52.50 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 72.00 DEG.F, CHAMBER TEMPERATURE = 74.00 DEG.F  
RELATIVE HUMIDITY = 66.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 79

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.697$   
TEMPERATURE RATIO  $TR = 0.996$   
MACH NUMBER  $MJ = 1.667$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 0.640$   
JET DENSITY RATIO  $DJ/D0 = 1.562$   
JET VELOCITY RATIO  $VJ/A0 = 1.334$   
JET VELOCITY  $VJ = 1511.1$  FPS

$TR/TJ = 1.556$   
 $DR/D0 = 4.715$   
 $DR/DJ = 3.019$   
MASS FLOW = 3.814 POUNDS PER SECOND  
THRUST = 179.12 POUNDS

SHOCK CELL LENGTH  $S = 2.934$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>1 15.0 | MICRO<br>PHONE<br>NO. ANGLE<br>2 22.5 | MICRO<br>PHONE<br>NO. ANGLE<br>3 30.0 | MICRO<br>PHONE<br>NO. ANGLE<br>4 37.5 | MICRO<br>PHONE<br>NO. ANGLE<br>5 45.0 | MICRO<br>PHONE<br>NO. ANGLE<br>6 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 100.3                                 | 99.9                                  | 90.1                                  | 87.5                                  | 85.3                                  | 82.9                                  |
| 250.0                                  | 102.7                                 | 102.3                                 | 96.5                                  | 91.0                                  | 87.8                                  | 85.9                                  |
| 315.2                                  | 106.4                                 | 103.6                                 | 100.8                                 | 94.2                                  | 91.0                                  | 89.6                                  |
| 400.0                                  | 108.5                                 | 108.7                                 | 102.9                                 | 98.2                                  | 94.5                                  | 92.2                                  |
| 500.0                                  | 111.9                                 | 109.8                                 | 106.4                                 | 101.2                                 | 96.9                                  | 93.3                                  |
| 630.0                                  | 112.5                                 | 112.3                                 | 110.4                                 | 104.6                                 | 99.8                                  | 96.2                                  |
| 800.0                                  | 115.5                                 | 115.7                                 | 112.9                                 | 107.8                                 | 103.0                                 | 98.4                                  |
| 1000.0                                 | 115.0                                 | 116.8                                 | 115.8                                 | 110.5                                 | 105.5                                 | 100.5                                 |
| 1250.0                                 | 115.9                                 | 118.7                                 | 118.4                                 | 113.7                                 | 108.6                                 | 102.1                                 |
| 1600.0                                 | 116.8                                 | 118.8                                 | 119.2                                 | 114.8                                 | 110.1                                 | 103.7                                 |
| 2000.0                                 | 117.1                                 | 119.6                                 | 120.1                                 | 116.3                                 | 111.5                                 | 105.1                                 |
| 2500.0                                 | 117.4                                 | 119.8                                 | 120.1                                 | 116.5                                 | 111.7                                 | 105.8                                 |
| 3150.0                                 | 117.6                                 | 120.1                                 | 120.5                                 | 116.3                                 | 111.7                                 | 106.5                                 |
| 4000.0                                 | 117.5                                 | 120.0                                 | 120.5                                 | 115.6                                 | 112.4                                 | 107.3                                 |
| 5000.0                                 | 116.5                                 | 119.3                                 | 119.3                                 | 113.9                                 | 111.9                                 | 107.8                                 |
| 6300.0                                 | 115.3                                 | 118.2                                 | 118.2                                 | 112.5                                 | 111.5                                 | 107.9                                 |
| 8000.0                                 | 113.6                                 | 116.3                                 | 116.6                                 | 111.2                                 | 110.8                                 | 107.3                                 |
| 10000.0                                | 113.5                                 | 112.7                                 | 115.2                                 | 109.0                                 | 110.1                                 | 107.2                                 |
| 12500.0                                | 110.3                                 | 114.0                                 | 113.9                                 | 108.8                                 | 109.5                                 | 106.9                                 |
| 16000.0                                | 108.5                                 | 112.8                                 | 112.3                                 | 107.3                                 | 108.1                                 | 106.0                                 |
| 20000.0                                | 106.6                                 | 111.5                                 | 111.2                                 | 106.2                                 | 106.7                                 | 105.2                                 |
| 25000.0                                | 105.1                                 | 110.5                                 | 110.4                                 | 105.2                                 | 105.7                                 | 104.5                                 |
| 31500.0                                | 103.2                                 | 109.4                                 | 109.3                                 | 103.9                                 | 104.4                                 | 103.7                                 |
| 40000.0                                | 102.2                                 | 109.0                                 | 108.5                                 | 103.2                                 | 103.4                                 | 103.4                                 |
| OVERALL<br>SPL                         | 127.6                                 | 129.8                                 | 129.9                                 | 125.2                                 | 122.2                                 | 118.2                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 83.7                                  | 84.4                                  | 84.1                                  | 82.2                                   | 82.6                                   | 82.1                                   |
| 250.0                                  | 85.9                                  | 85.3                                  | 84.9                                  | 83.9                                   | 84.1                                   | 83.6                                   |
| 315.2                                  | 88.8                                  | 88.4                                  | 87.4                                  | 87.4                                   | 86.1                                   | 85.3                                   |
| 400.0                                  | 91.2                                  | 90.7                                  | 90.1                                  | 89.0                                   | 88.8                                   | 87.7                                   |
| 500.0                                  | 93.0                                  | 92.7                                  | 91.2                                  | 89.9                                   | 89.2                                   | 88.8                                   |
| 630.0                                  | 95.4                                  | 94.4                                  | 93.4                                  | 92.1                                   | 92.0                                   | 91.3                                   |
| 800.0                                  | 97.5                                  | 95.9                                  | 94.7                                  | 93.5                                   | 93.8                                   | 93.4                                   |
| 1000.0                                 | 99.0                                  | 97.5                                  | 96.1                                  | 95.2                                   | 94.6                                   | 93.6                                   |
| 1250.0                                 | 100.0                                 | 98.9                                  | 97.6                                  | 96.7                                   | 96.4                                   | 95.8                                   |
| 1600.0                                 | 101.4                                 | 100.2                                 | 98.9                                  | 97.7                                   | 97.7                                   | 97.0                                   |
| 2000.0                                 | 102.6                                 | 101.2                                 | 100.1                                 | 98.8                                   | 98.7                                   | 97.7                                   |
| 2500.0                                 | 103.3                                 | 101.8                                 | 100.5                                 | 99.3                                   | 99.0                                   | 98.3                                   |
| 3150.0                                 | 104.4                                 | 102.5                                 | 101.1                                 | 100.1                                  | 99.9                                   | 99.3                                   |
| 4000.0                                 | 104.9                                 | 103.5                                 | 102.0                                 | 100.6                                  | 100.4                                  | 100.4                                  |
| 5000.0                                 | 105.4                                 | 103.8                                 | 102.1                                 | 101.3                                  | 101.1                                  | 100.6                                  |
| 6300.0                                 | 105.8                                 | 104.1                                 | 102.5                                 | 101.7                                  | 101.4                                  | 101.0                                  |
| 8000.0                                 | 105.7                                 | 104.1                                 | 102.6                                 | 101.3                                  | 101.3                                  | 101.0                                  |
| 10000.0                                | 106.0                                 | 104.1                                 | 102.4                                 | 101.4                                  | 101.7                                  | 101.4                                  |
| 12500.0                                | 105.9                                 | 104.0                                 | 102.7                                 | 101.6                                  | 101.4                                  | 101.1                                  |
| 16000.0                                | 105.1                                 | 103.7                                 | 102.6                                 | 100.9                                  | 101.0                                  | 100.7                                  |
| 20000.0                                | 104.8                                 | 103.1                                 | 102.3                                 | 100.5                                  | 100.6                                  | 100.1                                  |
| 25000.0                                | 104.3                                 | 102.7                                 | 102.0                                 | 100.2                                  | 100.0                                  | 99.2                                   |
| 31500.0                                | 103.4                                 | 102.2                                 | 102.0                                 | 99.4                                   | 99.5                                   | 98.4                                   |
| 40000.0                                | 102.6                                 | 102.1                                 | 101.5                                 | 98.6                                   | 99.4                                   | 97.6                                   |
| OVERALL<br>SPL                         | 116.6                                 | 115.1                                 | 113.9                                 | 112.5                                  | 112.5                                  | 111.9                                  |



SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 53.00 PSI, ATMOSPHERIC PRESSURE = 14.13 PSI  
RESERVOIR TEMPERATURE = 50.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 187

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 4.751  
TEMPERATURE RATIO TR = 0.981  
MACH NUMBER MJ = 1.675  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.628  
JET DENSITY RATIO DJ/D0 = 1.591  
JET VELOCITY RATIO VJ/A0 = 1.327  
JET VELOCITY VJ = 1483.8 FPS

TR/TJ = 1.561  
DR/D0 = 4.844  
DR/DJ = 3.044  
MASS FLOW = 3.868 POUNDS PER SECOND  
THRUST = 180.75 POUNDS

SHOCK CELL LENGTH S = 2.955 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 75.8                        | 78.8                        | 80.7                        | 79.6                        | 80.0                        | 78.2                        |
| 250.0                                  | 79.2                        | 80.1                        | 81.3                        | 79.4                        | 79.3                        | 77.8                        |
| 315.2                                  | 80.8                        | 81.4                        | 81.0                        | 81.2                        | 80.4                        | 80.2                        |
| 400.0                                  | 82.3                        | 83.3                        | 83.2                        | 83.0                        | 83.7                        | 84.3                        |
| 500.0                                  | 85.9                        | 85.9                        | 86.1                        | 86.8                        | 87.2                        | 87.1                        |
| 630.0                                  | 87.3                        | 88.1                        | 88.3                        | 89.0                        | 89.5                        | 89.2                        |
| 800.0                                  | 90.0                        | 90.8                        | 91.0                        | 91.0                        | 90.8                        | 90.1                        |
| 1000.0                                 | 92.1                        | 93.0                        | 92.8                        | 92.6                        | 92.3                        | 92.1                        |
| 1250.0                                 | 95.0                        | 95.5                        | 95.2                        | 94.7                        | 94.5                        | 94.5                        |
| 1600.0                                 | 96.6                        | 96.8                        | 95.9                        | 95.7                        | 95.2                        | 95.3                        |
| 2000.0                                 | 98.5                        | 98.1                        | 97.0                        | 96.7                        | 96.6                        | 96.5                        |
| 2500.0                                 | 99.4                        | 98.6                        | 97.8                        | 97.6                        | 97.4                        | 97.3                        |
| 3150.0                                 | 100.4                       | 99.7                        | 98.5                        | 99.4                        | 99.6                        | 99.5                        |
| 4000.0                                 | 101.1                       | 100.9                       | 100.0                       | 100.9                       | 101.1                       | 100.8                       |
| 5000.0                                 | 101.6                       | 101.7                       | 101.0                       | 101.3                       | 101.8                       | 101.5                       |
| 6300.0                                 | 102.1                       | 102.7                       | 101.5                       | 102.6                       | 103.0                       | 102.9                       |
| 8000.0                                 | 102.2                       | 103.4                       | 101.7                       | 102.8                       | 103.0                       | 102.2                       |
| 10000.0                                | 103.2                       | 104.4                       | 101.2                       | 102.7                       | 102.8                       | 101.7                       |
| 12500.0                                | 103.8                       | 103.7                       | 100.9                       | 102.5                       | 102.7                       | 101.7                       |
| 16000.0                                | 103.1                       | 103.2                       | 100.1                       | 102.3                       | 101.9                       | 100.8                       |
| 20000.0                                | 102.6                       | 103.5                       | 99.1                        | 101.3                       | 100.8                       | 100.0                       |
| 25000.0                                | 102.7                       | 102.9                       | 97.9                        | 100.7                       | 100.1                       | 99.6                        |
| 31500.0                                | 101.9                       | 103.1                       | 96.5                        | 100.1                       | 99.6                        | 99.3                        |
| 40000.0                                | 101.6                       | 103.2                       | 95.1                        | 99.9                        | 98.7                        | 99.4                        |
| OVERALL<br>SPL                         | 113.6                       | 114.1                       | 111.4                       | 112.8                       | 112.8                       | 112.3                       |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 17<br>ANGLE 135.0 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---|---|---|
| 200.0                                  | 75.4                                    | 75.0                                    | 74.6                                    | 75.3                                    |
| 250.0                                  | 78.1                                    | 77.5                                    | 77.8                                    | 77.4                                    |
| 315.2                                  | 79.8                                    | 79.0                                    | 78.7                                    | 78.8                                    |
| 400.0                                  | 83.1                                    | 81.8                                    | 81.5                                    | 81.0                                    |
| 500.0                                  | 86.0                                    | 85.5                                    | 84.9                                    | 83.4                                    |
| 630.0                                  | 89.3                                    | 88.4                                    | 87.0                                    | 84.6                                    |
| 800.0                                  | 89.8                                    | 88.9                                    | 88.4                                    | 86.9                                    |
| 1000.0                                 | 92.3                                    | 91.0                                    | 90.6                                    | 90.1                                    |
| 1250.0                                 | 94.1                                    | 93.9                                    | 94.1                                    | 92.7                                    |
| 1600.0                                 | 95.0                                    | 94.6                                    | 94.9                                    | 94.1                                    |
| 2000.0                                 | 96.1                                    | 96.8                                    | 97.7                                    | 97.4                                    |
| 2500.0                                 | 97.1                                    | 97.4                                    | 97.9                                    | 97.6                                    |
| 3150.0                                 | 99.6                                    | 100.2                                   | 100.6                                   | 101.0                                   |
| 4000.0                                 | 100.9                                   | 101.2                                   | 101.1                                   | 101.4                                   |
| 5000.0                                 | 101.9                                   | 101.9                                   | 101.9                                   | 101.7                                   |
| 6300.0                                 | 102.6                                   | 102.4                                   | 101.7                                   | 101.5                                   |
| 8000.0                                 | 102.1                                   | 101.7                                   | 100.5                                   | 100.3                                   |
| 10000.0                                | 101.6                                   | 101.0                                   | 99.7                                    | 99.5                                    |
| 12500.0                                | 101.0                                   | 100.3                                   | 98.8                                    | 98.1                                    |
| 16000.0                                | 99.8                                    | 99.1                                    | 97.9                                    | 96.5                                    |
| 20000.0                                | 98.9                                    | 98.1                                    | 96.8                                    | 95.1                                    |
| 25000.0                                | 98.2                                    | 97.2                                    | 96.1                                    | 93.9                                    |
| 31500.0                                | 97.6                                    | 96.7                                    | 95.7                                    | 93.1                                    |
| 40000.0                                | 97.2                                    | 96.7                                    | 94.8                                    | 92.2                                    |
| OVERALL<br>SPL                         | 111.8                                   | 111.5                                   | 111.0                                   | 110.5                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 52.50 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 206.00 DEG.F, CHAMBER TEMPERATURE = 82.00 DEG.F  
RELATIVE HUMIDITY = 54.0 PERCENT  
GAMMA = 1.399

RUN NUMBER 80

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 4.697  
TEMPERATURE RATIO TR = 1.229  
MACH NUMBER MJ = 1.667  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.790  
JET DENSITY RATIO DJ/D0 = 1.265  
JET VELOCITY RATIO VJ/A0 = 1.482  
JET VELOCITY VJ = 1691.6 FPS

TR/TJ = 1.555  
DR/D0 = 3.823  
DR/DJ = 3.022  
MASS FLOW = 3.433 POUNDS PER SECOND  
THRUST = 179.18 POUNDS

SHOCK CELL LENGTH S = 2.935 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 101.6 |       | 100.2 |       | 94.2  |       |
| 250.0   | 103.8 |       | 103.0 |       | 98.6  |       |
| 315.2   | 108.1 |       | 103.7 |       | 102.4 |       |
| 400.0   | 110.1 |       | 110.0 |       | 105.6 |       |
| 500.0   | 113.4 |       | 111.3 |       | 108.4 |       |
| 630.0   | 112.4 |       | 113.7 |       | 112.5 |       |
| 800.0   | 116.0 |       | 117.0 |       | 115.0 |       |
| 1000.0  | 115.5 |       | 117.3 |       | 117.7 |       |
| 1250.0  | 116.5 |       | 119.2 |       | 120.1 |       |
| 1600.0  | 117.1 |       | 119.5 |       | 120.8 |       |
| 2000.0  | 117.3 |       | 120.3 |       | 121.7 |       |
| 2500.0  | 117.5 |       | 120.8 |       | 122.1 |       |
| 3150.0  | 117.5 |       | 121.3 |       | 122.7 |       |
| 4000.0  | 117.1 |       | 120.9 |       | 122.9 |       |
| 5000.0  | 115.7 |       | 120.2 |       | 122.2 |       |
| 6300.0  | 114.3 |       | 118.6 |       | 120.6 |       |
| 8000.0  | 112.9 |       | 117.3 |       | 118.9 |       |
| 10000.0 | 111.4 |       | 116.1 |       | 117.6 |       |
| 12500.0 | 110.0 |       | 114.9 |       | 116.7 |       |
| 16000.0 | 108.5 |       | 113.7 |       | 115.6 |       |
| 20000.0 | 106.7 |       | 112.4 |       | 115.1 |       |
| 25000.0 | 105.2 |       | 111.5 |       | 114.4 |       |
| 31500.0 | 103.6 |       | 110.5 |       | 113.4 |       |
| 40000.0 | 102.7 |       | 110.1 |       | 112.8 |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 127.6 |       | 130.8 |       | 132.1 |       |
|         |       |       |       |       | 130.6 |       |
|         |       |       |       |       | 126.2 |       |
|         |       |       |       |       |       | 122.7 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 83.4                                  | 84.1                                  | 83.7                                  | 83.4                                   | 82.3                                   | 81.0                                   |
| 250.0                                  | 86.7                                  | 84.5                                  | 84.2                                  | 83.3                                   | 83.4                                   | 82.9                                   |
| 315.2                                  | 88.7                                  | 87.4                                  | 86.9                                  | 86.4                                   | 86.2                                   | 85.2                                   |
| 400.0                                  | 90.8                                  | 90.0                                  | 89.7                                  | 88.3                                   | 88.3                                   | 87.5                                   |
| 500.0                                  | 92.4                                  | 91.5                                  | 90.4                                  | 89.7                                   | 88.8                                   | 88.3                                   |
| 630.0                                  | 95.4                                  | 94.1                                  | 93.3                                  | 92.6                                   | 92.0                                   | 91.3                                   |
| 800.0                                  | 98.0                                  | 95.8                                  | 94.9                                  | 94.1                                   | 94.3                                   | 93.8                                   |
| 1000.0                                 | 99.8                                  | 97.8                                  | 96.6                                  | 95.8                                   | 95.0                                   | 94.4                                   |
| 1250.0                                 | 101.6                                 | 99.5                                  | 98.4                                  | 97.2                                   | 96.6                                   | 96.8                                   |
| 1600.0                                 | 103.4                                 | 100.7                                 | 99.7                                  | 98.9                                   | 98.2                                   | 97.6                                   |
| 2000.0                                 | 105.1                                 | 102.2                                 | 100.8                                 | 99.9                                   | 99.2                                   | 98.8                                   |
| 2500.0                                 | 106.1                                 | 103.0                                 | 101.8                                 | 100.6                                  | 99.9                                   | 99.9                                   |
| 3150.0                                 | 107.3                                 | 104.2                                 | 102.7                                 | 101.6                                  | 100.8                                  | 100.7                                  |
| 4000.0                                 | 108.3                                 | 105.2                                 | 103.6                                 | 102.3                                  | 101.8                                  | 101.8                                  |
| 5000.0                                 | 109.1                                 | 106.0                                 | 104.2                                 | 103.2                                  | 102.9                                  | 102.6                                  |
| 6300.0                                 | 109.6                                 | 106.2                                 | 104.5                                 | 103.7                                  | 102.8                                  | 102.5                                  |
| 8000.0                                 | 109.7                                 | 106.6                                 | 104.6                                 | 103.4                                  | 102.7                                  | 102.6                                  |
| 10000.0                                | 109.8                                 | 106.6                                 | 104.5                                 | 103.5                                  | 102.7                                  | 103.0                                  |
| 12500.0                                | 109.6                                 | 106.5                                 | 104.6                                 | 103.5                                  | 102.6                                  | 102.6                                  |
| 16000.0                                | 109.1                                 | 106.5                                 | 104.7                                 | 103.0                                  | 102.5                                  | 102.2                                  |
| 20000.0                                | 108.7                                 | 106.0                                 | 104.4                                 | 102.5                                  | 101.9                                  | 101.3                                  |
| 25000.0                                | 108.0                                 | 105.3                                 | 104.2                                 | 102.0                                  | 101.3                                  | 100.6                                  |
| 31500.0                                | 107.1                                 | 104.5                                 | 103.7                                 | 101.1                                  | 100.6                                  | 99.6                                   |
| 40000.0                                | 106.3                                 | 104.2                                 | 103.1                                 | 100.2                                  | 100.3                                  | 98.6                                   |
| OVERALL<br>SPL                         | 120.1                                 | 117.2                                 | 115.6                                 | 114.2                                  | 113.6                                  | 113.3                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 53.00 PSI, ATMOSPHERIC PRESSURE = 14.13 PSI  
RESERVOIR TEMPERATURE = 170.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 44.0 PERCENT  
GAMMA = 1.399

RUN NUMBER 188

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 4.751  
TEMPERATURE RATIO TR = 1.212  
MACH NUMBER MJ = 1.675  
JET STATIC TEMPERATURE RATIO TJ/TO = 0.777  
JET DENSITY RATIO DJ/DO = 1.287  
JET VELOCITY RATIO VJ/A0 = 1.476  
JET VELOCITY VJ = 1650.0 FPS

TR/TJ = 1.560  
DR/DO = 3.921  
DR/DJ = 3.046  
MASS FLOW = 3.479 POUNDS PER SECOND  
THRUST = 180.81 POUNDS

SHOCK CELL LENGTH S = 2.956 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 10 82.5                     | 11 90.0                     | 12 97.5                     | 13 105.0                    | 14 112.5                    | 15 120.0                    |
| 200.0                                  | 76.8                        | 79.0                        | 79.8                        | 80.2                        | 79.6                        | 78.5                        |
| 250.0                                  | 79.7                        | 81.0                        | 80.6                        | 79.9                        | 78.9                        | 77.9                        |
| 315.2                                  | 80.9                        | 81.5                        | 80.8                        | 80.4                        | 80.2                        | 79.3                        |
| 400.0                                  | 83.5                        | 83.2                        | 82.9                        | 83.5                        | 83.4                        | 83.8                        |
| 500.0                                  | 86.2                        | 86.6                        | 86.5                        | 87.4                        | 87.3                        | 87.4                        |
| 630.0                                  | 88.1                        | 88.5                        | 88.8                        | 90.4                        | 90.1                        | 90.4                        |
| 800.0                                  | 90.3                        | 91.0                        | 91.4                        | 91.6                        | 91.3                        | 90.8                        |
| 1000.0                                 | 92.2                        | 93.2                        | 93.3                        | 93.0                        | 92.6                        | 92.8                        |
| 1250.0                                 | 95.0                        | 96.1                        | 95.8                        | 95.4                        | 94.8                        | 95.0                        |
| 1600.0                                 | 97.0                        | 97.3                        | 96.4                        | 96.0                        | 95.9                        | 95.4                        |
| 2000.0                                 | 99.3                        | 99.1                        | 98.0                        | 97.9                        | 97.1                        | 96.6                        |
| 2500.0                                 | 100.3                       | 99.9                        | 98.8                        | 98.4                        | 98.1                        | 98.3                        |
| 3150.0                                 | 101.5                       | 100.8                       | 99.9                        | 100.6                       | 100.7                       | 101.3                       |
| 4000.0                                 | 102.4                       | 102.1                       | 102.3                       | 103.0                       | 103.2                       | 103.4                       |
| 5000.0                                 | 103.4                       | 103.9                       | 104.2                       | 104.2                       | 104.3                       | 104.3                       |
| 6300.0                                 | 104.7                       | 105.2                       | 105.0                       | 105.1                       | 105.2                       | 105.3                       |
| 8000.0                                 | 105.2                       | 106.1                       | 105.2                       | 105.2                       | 105.3                       | 104.8                       |
| 10000.0                                | 105.4                       | 106.6                       | 105.5                       | 105.2                       | 105.1                       | 104.8                       |
| 12500.0                                | 106.2                       | 106.5                       | 105.0                       | 104.8                       | 104.6                       | 103.8                       |
| 16000.0                                | 105.8                       | 105.8                       | 104.6                       | 104.5                       | 103.9                       | 103.0                       |
| 20000.0                                | 105.2                       | 105.9                       | 104.3                       | 103.7                       | 102.9                       | 101.9                       |
| 25000.0                                | 105.6                       | 105.8                       | 104.2                       | 103.3                       | 102.4                       | 101.8                       |
| 31500.0                                | 104.6                       | 105.7                       | 103.8                       | 102.5                       | 101.7                       | 101.3                       |
| 40000.0                                | 104.1                       | 105.5                       | 103.4                       | 102.3                       | 100.5                       | 101.3                       |
| OVERALL<br>SPL                         | 115.9                       | 116.4                       | 115.3                       | 115.1                       | 114.8                       | 114.5                       |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16 | ANGLE<br>127.5 | MICRO<br>PHONE<br>NO. 17 | ANGLE<br>135.0 | MICRO<br>PHONE<br>NO. 18 | ANGLE<br>142.5 | MICRO<br>PHONE<br>NO. 19 | ANGLE<br>150.0 |
|--|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|--------------------------|----------------|
| 200.0                                  | 76.1                     |                | 75.3                     |                | 74.4                     |                | 75.6                     |                |
| 250.0                                  | 77.3                     |                | 77.6                     |                | 77.4                     |                | 78.2                     |                |
| 315.2                                  | 79.8                     |                | 79.0                     |                | 79.5                     |                | 79.7                     |                |
| 400.0                                  | 83.6                     |                | 81.3                     |                | 81.5                     |                | 81.6                     |                |
| 500.0                                  | 87.5                     |                | 86.3                     |                | 85.3                     |                | 83.6                     |                |
| 630.0                                  | 90.7                     |                | 89.6                     |                | 88.0                     |                | 84.9                     |                |
| 800.0                                  | 90.7                     |                | 89.9                     |                | 89.2                     |                | 87.3                     |                |
| 1000.0                                 | 92.9                     |                | 91.3                     |                | 90.4                     |                | 90.1                     |                |
| 1250.0                                 | 94.8                     |                | 94.2                     |                | 94.5                     |                | 93.1                     |                |
| 1600.0                                 | 95.0                     |                | 94.9                     |                | 95.2                     |                | 94.6                     |                |
| 2000.0                                 | 96.6                     |                | 97.2                     |                | 98.8                     |                | 99.1                     |                |
| 2500.0                                 | 98.6                     |                | 99.0                     |                | 100.4                    |                | 100.8                    |                |
| 3150.0                                 | 101.6                    |                | 102.2                    |                | 104.0                    |                | 104.2                    |                |
| 4000.0                                 | 103.8                    |                | 104.2                    |                | 104.7                    |                | 105.1                    |                |
| 5000.0                                 | 104.7                    |                | 104.6                    |                | 104.7                    |                | 104.8                    |                |
| 6300.0                                 | 105.2                    |                | 104.8                    |                | 104.3                    |                | 104.3                    |                |
| 8000.0                                 | 104.8                    |                | 104.2                    |                | 103.0                    |                | 103.0                    |                |
| 10000.0                                | 103.8                    |                | 103.0                    |                | 102.0                    |                | 102.0                    |                |
| 12500.0                                | 103.3                    |                | 102.3                    |                | 100.9                    |                | 100.6                    |                |
| 16000.0                                | 102.1                    |                | 101.2                    |                | 100.0                    |                | 99.0                     |                |
| 20000.0                                | 101.2                    |                | 99.9                     |                | 98.7                     |                | 97.5                     |                |
| 25000.0                                | 100.6                    |                | 99.4                     |                | 98.2                     |                | 96.4                     |                |
| 31500.0                                | 99.8                     |                | 98.6                     |                | 97.6                     |                | 95.3                     |                |
| 40000.0                                | 99.3                     |                | 98.5                     |                | 96.7                     |                | 94.2                     |                |
| OVERALL<br>SPL                         | 114.1                    |                | 113.7                    |                | 113.5                    |                | 113.3                    |                |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 52.60 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 355.00 DEG.F, CHAMBER TEMPERATURE = 78.00 DEG.F  
RELATIVE HUMIDITY = 62.0 PERCENT  
GAMMA = 1.392

RUN NUMBER 81

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.704$   
TEMPERATURE RATIO  $TR = 1.515$   
MACH NUMBER  $MJ = 1.670$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.979$   
JET DENSITY RATIO  $DJ/D_0 = 1.021$   
JET VELOCITY RATIO  $VJ/A_0 = 1.653$   
JET VELOCITY  $VJ = 1879.1$  FPS

$TR/TJ = 1.547$   
 $DR/D_0 = 3.105$   
 $DR/DJ = 3.042$   
MASS FLOW = 3.089 POUNDS PER SECOND  
THRUST = 179.75 POUNDS

SHOCK CELL LENGTH  $S = 2.942$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 101.7                                 | 102.4                                 | 95.9                                  | 90.8                                  | 90.8                                  | 85.6                                  |
| 250.0                                  | 104.4                                 | 104.6                                 | 100.8                                 | 96.4                                  | 94.4                                  | 88.2                                  |
| 315.2                                  | 109.4                                 | 107.0                                 | 104.3                                 | 99.4                                  | 96.4                                  | 92.5                                  |
| 400.0                                  | 111.6                                 | 111.9                                 | 107.2                                 | 103.5                                 | 100.1                                 | 95.4                                  |
| 500.0                                  | 114.8                                 | 113.6                                 | 111.5                                 | 107.0                                 | 102.8                                 | 97.8                                  |
| 630.0                                  | 113.9                                 | 115.5                                 | 114.7                                 | 110.4                                 | 105.8                                 | 100.5                                 |
| 800.0                                  | 116.8                                 | 118.8                                 | 117.7                                 | 113.8                                 | 109.3                                 | 103.7                                 |
| 1000.0                                 | 115.8                                 | 118.8                                 | 119.9                                 | 116.8                                 | 112.1                                 | 106.9                                 |
| 1250.0                                 | 117.6                                 | 120.2                                 | 122.3                                 | 120.0                                 | 115.8                                 | 109.6                                 |
| 1600.0                                 | 117.4                                 | 120.6                                 | 122.6                                 | 121.0                                 | 117.5                                 | 111.9                                 |
| 2000.0                                 | 118.2                                 | 121.7                                 | 123.8                                 | 122.8                                 | 119.7                                 | 113.9                                 |
| 2500.0                                 | 118.5                                 | 122.5                                 | 124.2                                 | 123.1                                 | 120.6                                 | 115.1                                 |
| 3150.0                                 | 117.9                                 | 122.7                                 | 124.8                                 | 123.9                                 | 121.2                                 | 115.8                                 |
| 4000.0                                 | 116.3                                 | 121.7                                 | 124.6                                 | 124.2                                 | 121.6                                 | 116.1                                 |
| 5000.0                                 | 114.1                                 | 119.7                                 | 122.9                                 | 123.6                                 | 121.1                                 | 116.2                                 |
| 6300.0                                 | 112.8                                 | 118.6                                 | 121.5                                 | 122.7                                 | 120.3                                 | 116.1                                 |
| 8000.0                                 | 111.3                                 | 117.4                                 | 120.2                                 | 121.4                                 | 119.3                                 | 115.4                                 |
| 10000.0                                | 110.2                                 | 116.2                                 | 119.0                                 | 120.5                                 | 118.5                                 | 115.1                                 |
| 12500.0                                | 109.3                                 | 115.3                                 | 117.9                                 | 119.5                                 | 117.6                                 | 114.8                                 |
| 16000.0                                | 107.7                                 | 113.9                                 | 116.5                                 | 118.3                                 | 116.4                                 | 114.0                                 |
| 20000.0                                | 106.1                                 | 112.6                                 | 115.5                                 | 117.3                                 | 115.1                                 | 113.4                                 |
| 25000.0                                | 104.9                                 | 111.5                                 | 115.0                                 | 116.6                                 | 114.2                                 | 113.0                                 |
| 31500.0                                | 103.2                                 | 110.4                                 | 114.3                                 | 115.8                                 | 113.4                                 | 112.5                                 |
| 40000.0                                | 102.0                                 | 110.0                                 | 113.8                                 | 115.6                                 | 112.6                                 | 112.2                                 |
| OVERALL<br>SPL                         | 127.9                                 | 131.7                                 | 133.8                                 | 133.5                                 | 130.8                                 | 126.5                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 85.0                                  | 84.9                                  | 85.0                                  | 84.4                                   | 83.8                                   | 83.0                                   |
| 250.0                                  | 87.5                                  | 86.2                                  | 85.9                                  | 84.4                                   | 85.6                                   | 84.0                                   |
| 315.2                                  | 90.1                                  | 88.5                                  | 88.4                                  | 87.8                                   | 87.4                                   | 86.3                                   |
| 400.0                                  | 93.0                                  | 90.8                                  | 91.2                                  | 89.8                                   | 90.0                                   | 89.1                                   |
| 500.0                                  | 94.6                                  | 91.8                                  | 92.2                                  | 91.0                                   | 90.6                                   | 90.1                                   |
| 630.0                                  | 97.5                                  | 95.3                                  | 94.3                                  | 94.1                                   | 93.5                                   | 92.6                                   |
| 800.0                                  | 99.9                                  | 97.3                                  | 96.3                                  | 95.2                                   | 95.4                                   | 95.0                                   |
| 1000.0                                 | 102.4                                 | 99.3                                  | 98.2                                  | 97.0                                   | 96.4                                   | 95.8                                   |
| 1250.0                                 | 104.6                                 | 101.0                                 | 100.1                                 | 98.7                                   | 98.4                                   | 97.9                                   |
| 1600.0                                 | 106.2                                 | 102.7                                 | 101.0                                 | 100.1                                  | 99.6                                   | 99.3                                   |
| 2000.0                                 | 108.0                                 | 104.0                                 | 102.5                                 | 101.0                                  | 100.4                                  | 100.0                                  |
| 2500.0                                 | 109.3                                 | 105.0                                 | 103.5                                 | 102.2                                  | 101.7                                  | 101.6                                  |
| 3150.0                                 | 110.6                                 | 106.2                                 | 104.7                                 | 103.4                                  | 103.0                                  | 102.5                                  |
| 4000.0                                 | 111.7                                 | 107.5                                 | 106.0                                 | 104.3                                  | 104.1                                  | 104.2                                  |
| 5000.0                                 | 112.3                                 | 108.3                                 | 106.5                                 | 105.3                                  | 105.3                                  | 105.8                                  |
| 6300.0                                 | 113.0                                 | 109.0                                 | 107.0                                 | 106.5                                  | 106.5                                  | 106.9                                  |
| 8000.0                                 | 112.9                                 | 109.3                                 | 107.6                                 | 106.8                                  | 107.0                                  | 107.4                                  |
| 10000.0                                | 113.0                                 | 109.6                                 | 107.9                                 | 107.2                                  | 107.5                                  | 108.2                                  |
| 12500.0                                | 113.0                                 | 109.9                                 | 108.3                                 | 107.6                                  | 107.7                                  | 108.3                                  |
| 16000.0                                | 112.4                                 | 109.7                                 | 108.4                                 | 107.3                                  | 107.6                                  | 107.9                                  |
| 20000.0                                | 112.0                                 | 109.2                                 | 108.3                                 | 106.8                                  | 107.2                                  | 107.2                                  |
| 25000.0                                | 111.6                                 | 108.8                                 | 108.2                                 | 106.4                                  | 106.8                                  | 106.5                                  |
| 31500.0                                | 110.7                                 | 108.4                                 | 108.0                                 | 105.7                                  | 106.2                                  | 105.5                                  |
| 40000.0                                | 110.2                                 | 108.3                                 | 107.4                                 | 104.8                                  | 105.9                                  | 104.6                                  |
| OVERALL<br>SPL                         | 123.4                                 | 120.1                                 | 118.8                                 | 117.5                                  | 117.7                                  | 117.7                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 52.80 PSI, ATMOSPHERIC PRESSURE = 14.13 PSI  
RESERVOIR TEMPERATURE = 335.00 DEG.F, CHAMBER TEMPERATURE = 62.00 DEG.F  
RELATIVE HUMIDITY = 42.0 PERCENT  
GAMMA = 1.392

RUN NUMBER 189

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $P_r = 4.737$   
TEMPERATURE RATIO  $T_r = 1.523$   
MACH NUMBER  $M_J = 1.675$   
JET STATIC TEMPERATURE RATIO  $T_J/T_0 = 0.983$   
JET DENSITY RATIO  $\rho_J/\rho_0 = 1.017$   
JET VELOCITY RATIO  $V_J/A_0 = 1.660$   
JET VELOCITY  $V_J = 1859.2$  FPS

$T_r/T_J = 1.550$   
 $\rho_r/\rho_0 = 3.110$   
 $\rho_r/\rho_J = 3.057$   
MASS FLOW = 3.093 POUNDS PER SECOND  
THRUST = 180.74 POUNDS

SHOCK CELL LENGTH  $S = 2.955$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 77.7                                   | 80.1                                   | 81.0                                   | 81.6                                    | 79.7                                    | 79.8                                    |
| 250.0                                  | 81.3                                   | 81.9                                   | 80.8                                   | 81.4                                    | 79.2                                    | 79.0                                    |
| 315.2                                  | 82.5                                   | 82.6                                   | 81.6                                   | 81.6                                    | 80.2                                    | 80.2                                    |
| 400.0                                  | 83.6                                   | 84.6                                   | 83.8                                   | 83.8                                    | 84.2                                    | 84.8                                    |
| 500.0                                  | 88.0                                   | 88.4                                   | 88.1                                   | 88.9                                    | 89.2                                    | 89.0                                    |
| 630.0                                  | 89.8                                   | 89.8                                   | 90.0                                   | 91.8                                    | 92.2                                    | 92.6                                    |
| 800.0                                  | 91.8                                   | 92.4                                   | 92.3                                   | 92.4                                    | 92.2                                    | 92.3                                    |
| 1000.0                                 | 93.9                                   | 94.5                                   | 94.2                                   | 94.0                                    | 93.4                                    | 94.0                                    |
| 1250.0                                 | 96.8                                   | 97.8                                   | 96.9                                   | 96.1                                    | 95.8                                    | 95.5                                    |
| 1600.0                                 | 98.6                                   | 98.6                                   | 97.7                                   | 97.0                                    | 97.0                                    | 96.2                                    |
| 2000.0                                 | 100.8                                  | 100.3                                  | 99.3                                   | 98.6                                    | 98.3                                    | 97.9                                    |
| 2500.0                                 | 102.3                                  | 101.2                                  | 100.1                                  | 99.6                                    | 99.2                                    | 99.0                                    |
| 3150.0                                 | 103.5                                  | 102.4                                  | 101.0                                  | 101.2                                   | 101.3                                   | 101.1                                   |
| 4000.0                                 | 104.1                                  | 103.6                                  | 102.7                                  | 102.8                                   | 103.7                                   | 103.2                                   |
| 5000.0                                 | 104.7                                  | 105.1                                  | 105.1                                  | 104.3                                   | 105.3                                   | 104.7                                   |
| 6300.0                                 | 105.8                                  | 106.6                                  | 106.2                                  | 105.7                                   | 106.4                                   | 106.1                                   |
| 8000.0                                 | 106.5                                  | 107.6                                  | 106.3                                  | 106.4                                   | 106.6                                   | 106.2                                   |
| 10000.0                                | 107.5                                  | 108.6                                  | 106.2                                  | 106.6                                   | 106.4                                   | 105.8                                   |
| 12500.0                                | 107.9                                  | 108.2                                  | 106.4                                  | 106.2                                   | 106.2                                   | 105.5                                   |
| 16000.0                                | 107.7                                  | 107.6                                  | 106.0                                  | 105.9                                   | 105.5                                   | 104.7                                   |
| 20000.0                                | 107.3                                  | 107.8                                  | 105.8                                  | 105.3                                   | 104.5                                   | 103.9                                   |
| 25000.0                                | 107.5                                  | 107.8                                  | 105.8                                  | 104.8                                   | 104.1                                   | 103.7                                   |
| 31500.0                                | 106.6                                  | 107.8                                  | 105.5                                  | 104.0                                   | 103.5                                   | 103.2                                   |
| 40000.0                                | 106.1                                  | 107.7                                  | 105.0                                  | 103.8                                   | 102.4                                   | 103.2                                   |
| OVERALL<br>SPL                         | 117.6                                  | 118.2                                  | 116.6                                  | 116.2                                   | 116.1                                   | 115.7                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 17    | 135.0 | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   |       | 77.2  |       | 74.7  |       | 76.0  |       | 75.8  |  |
| 250.0   |       | 78.3  |       | 77.8  |       | 78.1  |       | 78.5  |  |
| 315.2   |       | 79.8  |       | 79.3  |       | 80.2  |       | 80.1  |  |
| 400.0   |       | 84.0  |       | 82.1  |       | 82.1  |       | 82.5  |  |
| 500.0   |       | 89.2  |       | 87.7  |       | 87.5  |       | 85.6  |  |
| 630.0   |       | 93.2  |       | 91.9  |       | 90.0  |       | 86.2  |  |
| 800.0   |       | 92.4  |       | 91.6  |       | 90.8  |       | 88.0  |  |
| 1000.0  |       | 93.5  |       | 92.2  |       | 91.5  |       | 90.4  |  |
| 1250.0  |       | 96.1  |       | 95.2  |       | 95.0  |       | 93.5  |  |
| 1600.0  |       | 95.5  |       | 95.5  |       | 96.1  |       | 95.4  |  |
| 2000.0  |       | 97.2  |       | 97.5  |       | 98.6  |       | 97.9  |  |
| 2500.0  |       | 98.6  |       | 99.1  |       | 100.0 |       | 100.7 |  |
| 3150.0  |       | 101.3 |       | 102.0 |       | 102.8 |       | 104.2 |  |
| 4000.0  |       | 103.9 |       | 104.6 |       | 104.6 |       | 105.5 |  |
| 5000.0  |       | 105.1 |       | 105.1 |       | 105.4 |       | 105.6 |  |
| 6300.0  |       | 106.1 |       | 105.8 |       | 105.5 |       | 105.3 |  |
| 8000.0  |       | 105.8 |       | 105.4 |       | 104.6 |       | 104.1 |  |
| 10000.0 |       | 105.2 |       | 104.3 |       | 103.6 |       | 102.9 |  |
| 12500.0 |       | 104.6 |       | 103.6 |       | 102.7 |       | 101.9 |  |
| 16000.0 |       | 103.7 |       | 102.6 |       | 101.5 |       | 100.2 |  |
| 20000.0 |       | 102.8 |       | 101.4 |       | 100.6 |       | 98.9  |  |
| 25000.0 |       | 102.3 |       | 100.9 |       | 100.2 |       | 97.9  |  |
| 31500.0 |       | 101.6 |       | 100.2 |       | 99.5  |       | 96.8  |  |
| 40000.0 |       | 101.0 |       | 100.2 |       | 98.8  |       | 95.9  |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     |       | 115.1 |       | 114.6 |       | 114.3 |       | 114.0 |  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 52.20 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 750.00 DEG.F, CHAMBER TEMPERATURE = 82.00 DEG.F  
RELATIVE HUMIDITY = 56.0 PERCENT  
GAMMA = 1.370

RUN NUMBER 82

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.676$   
TEMPERATURE RATIO  $TR = 2.232$   
MACH NUMBER  $MJ = 1.671$   
JET STATIC TEMPERATURE RATIO  $TJ/TO = 1.472$   
JET DENSITY RATIO  $DJ/DO = 0.679$   
JET VELOCITY RATIO  $VJ/AO = 2.028$   
JET VELOCITY  $VJ = 2313.9$  FPS

$TR/TJ = 1.517$   
 $DR/DO = 2.095$   
 $DR/DJ = 3.083$   
MASS FLOW = 2.522 POUNDS PER SECOND  
THRUST = 180.04 POUNDS

SHOCK CELL LENGTH  $S = 2.946$  INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 1<br>ANGLE 15.0 | MICRO<br>PHONE<br>NO. 2<br>ANGLE 22.5 | MICRO<br>PHONE<br>NO. 3<br>ANGLE 30.0 | MICRO<br>PHONE<br>NO. 4<br>ANGLE 37.5 | MICRO<br>PHONE<br>NO. 5<br>ANGLE 45.0 | MICRO<br>PHONE<br>NO. 6<br>ANGLE 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 103.0                                 | 103.8                                 | 99.0                                  | 93.1                                  | 97.8                                  | 93.4                                  |
| 250.0                                  | 105.9                                 | 106.3                                 | 104.2                                 | 99.2                                  | 99.6                                  | 95.6                                  |
| 315.2                                  | 111.0                                 | 108.2                                 | 107.0                                 | 103.2                                 | 100.8                                 | 97.4                                  |
| 400.0                                  | 113.3                                 | 113.4                                 | 110.3                                 | 106.3                                 | 104.6                                 | 100.2                                 |
| 500.0                                  | 115.6                                 | 115.0                                 | 113.0                                 | 109.6                                 | 105.7                                 | 101.5                                 |
| 630.0                                  | 114.2                                 | 116.2                                 | 117.0                                 | 113.5                                 | 108.6                                 | 105.0                                 |
| 800.0                                  | 116.6                                 | 119.3                                 | 119.2                                 | 117.1                                 | 111.9                                 | 108.4                                 |
| 1000.0                                 | 115.5                                 | 118.4                                 | 120.8                                 | 119.6                                 | 114.4                                 | 111.0                                 |
| 1250.0                                 | 116.7                                 | 119.8                                 | 122.1                                 | 121.8                                 | 118.4                                 | 114.4                                 |
| 1600.0                                 | 116.6                                 | 119.8                                 | 122.1                                 | 123.0                                 | 120.4                                 | 117.3                                 |
| 2000.0                                 | 116.7                                 | 120.8                                 | 122.9                                 | 124.3                                 | 122.4                                 | 119.8                                 |
| 2500.0                                 | 116.5                                 | 120.8                                 | 123.7                                 | 125.0                                 | 123.2                                 | 121.4                                 |
| 3150.0                                 | 115.5                                 | 120.3                                 | 124.0                                 | 125.8                                 | 124.2                                 | 122.5                                 |
| 4000.0                                 | 114.6                                 | 119.3                                 | 123.2                                 | 125.9                                 | 125.3                                 | 123.3                                 |
| 5000.0                                 | 113.8                                 | 118.5                                 | 122.1                                 | 124.8                                 | 125.4                                 | 123.8                                 |
| 6300.0                                 | 113.3                                 | 117.7                                 | 121.0                                 | 123.6                                 | 124.3                                 | 123.3                                 |
| 8000.0                                 | 112.2                                 | 116.8                                 | 120.1                                 | 122.2                                 | 122.7                                 | 122.1                                 |
| 10000.0                                | 111.0                                 | 115.9                                 | 118.9                                 | 121.0                                 | 121.4                                 | 121.2                                 |
| 12500.0                                | 109.9                                 | 114.9                                 | 117.9                                 | 120.3                                 | 120.1                                 | 120.2                                 |
| 16000.0                                | 108.2                                 | 113.8                                 | 116.5                                 | 119.3                                 | 118.9                                 | 119.0                                 |
| 20000.0                                | 106.5                                 | 112.6                                 | 115.7                                 | 118.8                                 | 117.7                                 | 118.1                                 |
| 25000.0                                | 105.0                                 | 111.8                                 | 114.9                                 | 118.0                                 | 117.0                                 | 117.3                                 |
| 31500.0                                | 103.4                                 | 110.7                                 | 114.0                                 | 117.3                                 | 116.5                                 | 116.9                                 |
| 40000.0                                | 102.3                                 | 110.2                                 | 113.5                                 | 117.2                                 | 116.6                                 | 116.9                                 |
| OVERALL<br>SPL                         | 127.3                                 | 130.8                                 | 133.4                                 | 135.0                                 | 134.1                                 | 132.7                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 87.4                                  | 86.4                                  | 86.4                                  | 85.0                                   | 84.4                                   | 83.4                                   |
| 250.0                                  | 90.7                                  | 88.2                                  | 86.6                                  | 85.5                                   | 86.6                                   | 84.9                                   |
| 315.2                                  | 92.0                                  | 89.7                                  | 88.9                                  | 88.7                                   | 88.4                                   | 87.5                                   |
| 400.0                                  | 95.6                                  | 91.8                                  | 92.1                                  | 91.0                                   | 91.0                                   | 89.8                                   |
| 500.0                                  | 97.5                                  | 93.1                                  | 92.3                                  | 91.5                                   | 91.0                                   | 90.6                                   |
| 630.0                                  | 100.3                                 | 95.7                                  | 95.0                                  | 94.4                                   | 93.6                                   | 93.1                                   |
| 800.0                                  | 103.2                                 | 98.2                                  | 97.5                                  | 96.6                                   | 95.6                                   | 95.7                                   |
| 1000.0                                 | 106.2                                 | 100.1                                 | 99.6                                  | 98.6                                   | 97.6                                   | 97.0                                   |
| 1250.0                                 | 108.9                                 | 102.3                                 | 101.3                                 | 100.1                                  | 99.7                                   | 99.2                                   |
| 1600.0                                 | 111.6                                 | 104.2                                 | 102.8                                 | 102.1                                  | 101.3                                  | 100.2                                  |
| 2000.0                                 | 114.0                                 | 106.5                                 | 104.7                                 | 103.5                                  | 102.7                                  | 101.9                                  |
| 2500.0                                 | 115.7                                 | 107.9                                 | 106.0                                 | 105.0                                  | 104.0                                  | 103.2                                  |
| 3150.0                                 | 117.2                                 | 109.4                                 | 107.4                                 | 106.5                                  | 105.3                                  | 104.8                                  |
| 4000.0                                 | 118.1                                 | 110.9                                 | 108.8                                 | 107.9                                  | 106.5                                  | 106.0                                  |
| 5000.0                                 | 118.9                                 | 112.2                                 | 109.9                                 | 109.1                                  | 107.9                                  | 107.6                                  |
| 6300.0                                 | 119.0                                 | 112.9                                 | 110.6                                 | 109.9                                  | 109.2                                  | 109.0                                  |
| 8000.0                                 | 118.7                                 | 113.3                                 | 111.2                                 | 110.4                                  | 109.9                                  | 109.8                                  |
| 10000.0                                | 118.5                                 | 113.6                                 | 111.5                                 | 111.0                                  | 110.4                                  | 110.2                                  |
| 12500.0                                | 118.1                                 | 113.7                                 | 111.9                                 | 111.3                                  | 110.7                                  | 110.4                                  |
| 16000.0                                | 117.3                                 | 113.5                                 | 112.1                                 | 111.1                                  | 110.9                                  | 110.2                                  |
| 20000.0                                | 116.7                                 | 112.8                                 | 111.9                                 | 110.8                                  | 110.5                                  | 109.7                                  |
| 25000.0                                | 116.0                                 | 112.2                                 | 111.7                                 | 110.5                                  | 110.0                                  | 109.1                                  |
| 31500.0                                | 115.0                                 | 111.7                                 | 111.3                                 | 109.6                                  | 109.3                                  | 108.2                                  |
| 40000.0                                | 114.3                                 | 111.8                                 | 110.8                                 | 108.8                                  | 109.0                                  | 107.3                                  |
| OVERALL<br>SPL                         | 128.9                                 | 123.6                                 | 122.1                                 | 121.1                                  | 120.5                                  | 119.9                                  |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 52.30 PSI, ATMOSPHERIC PRESSURE = 14.13 PSI  
RESERVOIR TEMPERATURE = 705.00 DEG.F, CHAMBER TEMPERATURE = 62.00 DEG.F  
RELATIVE HUMIDITY = 42.0 PERCENT  
GAMMA = 1.370

RUN NUMBER 190

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.701$   
TEMPERATURE RATIO  $TR = 2.232$   
MACH NUMBER  $MJ = 1.675$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.469$   
JET DENSITY RATIO  $DJ/D0 = 0.681$   
JET VELOCITY RATIO  $VJ/A0 = 2.030$   
JET VELOCITY  $VJ = 2273.7$  FPS

$TR/TJ = 1.519$   
 $DR/D0 = 2.107$   
 $DR/DJ = 3.095$   
MASS FLOW = 2.530 POUNDS PER SECOND  
THRUST = 180.81 POUNDS

SHOCK CELL LENGTH  $S = 2.956$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 10.0                                   | 81.3                                   | 82.8                                   | 82.8                                    | 80.8                                    | 81.4                                    |
| 250.0                                  | 82.6                                   | 83.6                                   | 83.0                                   | 82.5                                    | 81.3                                    | 79.5                                    |
| 315.0                                  | 84.1                                   | 83.5                                   | 82.8                                   | 82.2                                    | 81.6                                    | 82.2                                    |
| 400.0                                  | 86.4                                   | 85.8                                   | 85.0                                   | 85.8                                    | 85.6                                    | 87.5                                    |
| 500.0                                  | 90.4                                   | 89.2                                   | 90.0                                   | 90.1                                    | 90.6                                    | 91.6                                    |
| 630.0                                  | 92.1                                   | 91.2                                   | 92.2                                   | 93.2                                    | 94.4                                    | 95.7                                    |
| 800.0                                  | 94.7                                   | 94.3                                   | 94.3                                   | 94.4                                    | 94.4                                    | 95.6                                    |
| 1000.0                                 | 96.2                                   | 96.5                                   | 95.8                                   | 95.0                                    | 94.6                                    | 95.5                                    |
| 1250.0                                 | 99.2                                   | 99.4                                   | 98.2                                   | 98.0                                    | 96.7                                    | 97.6                                    |
| 1600.0                                 | 101.4                                  | 100.8                                  | 99.6                                   | 98.8                                    | 98.2                                    | 98.5                                    |
| 2000.0                                 | 103.6                                  | 102.5                                  | 101.1                                  | 100.8                                   | 99.6                                    | 99.7                                    |
| 2500.0                                 | 105.2                                  | 103.5                                  | 102.2                                  | 101.8                                   | 100.7                                   | 101.1                                   |
| 3150.0                                 | 106.5                                  | 104.8                                  | 103.5                                  | 103.3                                   | 102.6                                   | 103.1                                   |
| 4000.0                                 | 107.5                                  | 106.1                                  | 104.9                                  | 104.6                                   | 104.9                                   | 105.7                                   |
| 5000.0                                 | 108.0                                  | 107.0                                  | 106.4                                  | 105.9                                   | 106.9                                   | 107.2                                   |
| 6300.0                                 | 108.9                                  | 109.3                                  | 108.0                                  | 107.5                                   | 107.9                                   | 108.5                                   |
| 8000.0                                 | 109.7                                  | 110.4                                  | 108.4                                  | 107.8                                   | 108.1                                   | 108.3                                   |
| 10000.0                                | 110.5                                  | 110.9                                  | 108.9                                  | 108.2                                   | 107.9                                   | 108.0                                   |
| 12500.0                                | 111.2                                  | 110.6                                  | 108.9                                  | 108.2                                   | 108.0                                   | 107.5                                   |
| 16000.0                                | 110.9                                  | 110.3                                  | 108.7                                  | 108.1                                   | 107.6                                   | 107.0                                   |
| 20000.0                                | 110.4                                  | 110.8                                  | 108.7                                  | 107.6                                   | 106.9                                   | 106.5                                   |
| 25000.0                                | 110.8                                  | 110.6                                  | 108.9                                  | 107.5                                   | 106.6                                   | 106.5                                   |
| 31500.0                                | 110.1                                  | 110.8                                  | 108.8                                  | 106.9                                   | 106.3                                   | 106.2                                   |
| 40000.0                                | 109.8                                  | 111.0                                  | 108.6                                  | 107.0                                   | 105.4                                   | 106.3                                   |
| OVERALL<br>SPL                         | 120.9                                  | 120.8                                  | 119.1                                  | 118.2                                   | 117.9                                   | 118.1                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>16 127.5 | MICRO<br>PHONE<br>NO. ANGLE<br>17 135.0 | MICRO<br>PHONE<br>NO. ANGLE<br>18 142.5 | MICRO<br>PHONE<br>NO. ANGLE<br>19 150.0 |
|--|---|---|---|---|
| 200.0                                  | 79.4                                    | 77.0                                    | 77.3                                    | 77.8                                    |
| 250.0                                  | 79.0                                    | 79.4                                    | 80.1                                    | 80.9                                    |
| 315.2                                  | 81.3                                    | 81.9                                    | 83.5                                    | 83.9                                    |
| 400.0                                  | 85.9                                    | 84.4                                    | 85.0                                    | 85.9                                    |
| 500.0                                  | 91.9                                    | 90.7                                    | 90.0                                    | 88.6                                    |
| 630.0                                  | 95.9                                    | 95.3                                    | 93.2                                    | 88.3                                    |
| 800.0                                  | 95.4                                    | 95.0                                    | 93.8                                    | 90.2                                    |
| 1000.0                                 | 95.6                                    | 94.3                                    | 92.8                                    | 91.7                                    |
| 1250.0                                 | 97.4                                    | 96.7                                    | 96.2                                    | 94.5                                    |
| 1600.0                                 | 97.8                                    | 97.1                                    | 97.8                                    | 96.8                                    |
| 2000.0                                 | 98.8                                    | 99.4                                    | 99.6                                    | 98.4                                    |
| 2500.0                                 | 100.2                                   | 100.7                                   | 101.6                                   | 101.1                                   |
| 3150.0                                 | 102.5                                   | 102.4                                   | 103.5                                   | 104.1                                   |
| 4000.0                                 | 105.2                                   | 104.9                                   | 105.9                                   | 106.5                                   |
| 5000.0                                 | 106.6                                   | 106.2                                   | 106.7                                   | 107.2                                   |
| 6300.0                                 | 107.4                                   | 107.4                                   | 107.0                                   | 107.1                                   |
| 8000.0                                 | 107.5                                   | 107.1                                   | 106.2                                   | 106.2                                   |
| 10000.0                                | 107.1                                   | 106.3                                   | 105.4                                   | 105.0                                   |
| 12500.0                                | 106.6                                   | 105.9                                   | 104.4                                   | 104.0                                   |
| 16000.0                                | 105.9                                   | 105.0                                   | 103.7                                   | 102.6                                   |
| 20000.0                                | 105.2                                   | 104.1                                   | 102.7                                   | 101.3                                   |
| 25000.0                                | 104.9                                   | 103.7                                   | 102.6                                   | 100.5                                   |
| 31500.0                                | 104.4                                   | 103.1                                   | 102.1                                   | 99.6                                    |
| 40000.0                                | 104.0                                   | 103.4                                   | 101.4                                   | 98.7                                    |
| OVERALL<br>SPL                         | 117.0                                   | 116.5                                   | 116.0                                   | 115.6                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 51.60 PSI, ATMOSPHERIC PRESSURE = 14.20 PSI  
RESERVOIR TEMPERATURE = 1025.00 DEG.F, CHAMBER TEMPERATURE = 82.00 DEG.F  
RELATIVE HUMIDITY = 56.0 PERCENT  
GAMMA = 1.350

RUN NUMBER 83

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.634$   
TEMPERATURE RATIO  $TR = 2.740$   
MACH NUMBER  $MJ = 1.670$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.841$   
JET DENSITY RATIO  $DJ/D_0 = 0.543$   
JET VELOCITY RATIO  $VJ/A_0 = 2.266$   
JET VELOCITY  $VJ = 2586.2$  FPS

$TR/TJ = 1.488$   
 $DR/D_0 = 1.691$   
 $DR/DJ = 3.114$   
MASS FLOW = 2.254 POUNDS PER SECOND  
THRUST = 179.80 POUNDS

SHOCK CELL LENGTH  $S = 2.943$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 103.9 |       | 105.0 |       | 99.8  |       |
| 250.0   | 106.7 |       | 106.8 |       | 103.8 |       |
| 315.2   | 112.0 |       | 109.9 |       | 107.9 |       |
| 400.0   | 114.2 |       | 114.4 |       | 111.6 |       |
| 500.0   | 115.8 |       | 116.2 |       | 114.8 |       |
| 630.0   | 114.4 |       | 117.4 |       | 118.3 |       |
| 800.0   | 117.1 |       | 119.9 |       | 120.4 |       |
| 1000.0  | 115.8 |       | 119.4 |       | 122.4 |       |
| 1250.0  | 117.0 |       | 120.6 |       | 122.8 |       |
| 1600.0  | 116.9 |       | 120.6 |       | 123.0 |       |
| 2000.0  | 117.1 |       | 121.4 |       | 124.3 |       |
| 2500.0  | 116.7 |       | 121.4 |       | 124.6 |       |
| 3150.0  | 115.9 |       | 120.6 |       | 124.2 |       |
| 4000.0  | 115.2 |       | 120.0 |       | 123.4 |       |
| 5000.0  | 114.4 |       | 119.1 |       | 121.9 |       |
| 6300.0  | 113.2 |       | 118.0 |       | 120.6 |       |
| 8000.0  | 111.6 |       | 116.9 |       | 119.0 |       |
| 10000.0 | 110.6 |       | 115.6 |       | 118.1 |       |
| 12500.0 | 109.7 |       | 114.4 |       | 117.1 |       |
| 16000.0 | 108.5 |       | 113.2 |       | 115.8 |       |
| 20000.0 | 107.2 |       | 111.9 |       | 115.1 |       |
| 25000.0 | 105.4 |       | 110.8 |       | 114.5 |       |
| 31500.0 | 103.4 |       | 109.5 |       | 113.7 |       |
| 40000.0 | 102.4 |       | 109.0 |       | 113.2 |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 127.6 |       | 131.4 |       | 133.9 |       |
|         |       |       |       |       | 134.7 |       |
|         |       |       |       |       | 134.2 |       |
|         |       |       |       |       |       | 133.9 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 7<br>ANGLE 60.0 | MICRO<br>PHONE<br>NO. 8<br>ANGLE 67.5 | MICRO<br>PHONE<br>NO. 9<br>ANGLE 75.0 | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| 200.0                                  | 90.4                                  | 87.4                                  | 86.7                                  | 86.2                                   | 84.8                                   | 83.8                                   |
| 250.0                                  | 92.9                                  | 88.7                                  | 87.8                                  | 86.9                                   | 86.1                                   | 85.8                                   |
| 315.2                                  | 93.8                                  | 90.2                                  | 89.8                                  | 89.3                                   | 88.3                                   | 87.7                                   |
| 400.0                                  | 96.7                                  | 92.5                                  | 92.1                                  | 91.6                                   | 91.0                                   | 90.7                                   |
| 500.0                                  | 97.3                                  | 93.4                                  | 92.8                                  | 92.2                                   | 91.6                                   | 91.4                                   |
| 630.0                                  | 101.9                                 | 96.0                                  | 95.8                                  | 95.4                                   | 94.4                                   | 93.7                                   |
| 800.0                                  | 104.7                                 | 98.4                                  | 97.9                                  | 97.3                                   | 96.7                                   | 96.5                                   |
| 1000.0                                 | 107.9                                 | 100.6                                 | 99.9                                  | 99.0                                   | 98.3                                   | 97.5                                   |
| 1250.0                                 | 111.0                                 | 102.7                                 | 102.1                                 | 100.9                                  | 100.1                                  | 99.5                                   |
| 1600.0                                 | 113.7                                 | 104.8                                 | 103.7                                 | 102.6                                  | 101.9                                  | 101.0                                  |
| 2000.0                                 | 116.4                                 | 107.2                                 | 105.6                                 | 104.3                                  | 103.3                                  | 102.6                                  |
| 2500.0                                 | 118.2                                 | 108.7                                 | 107.4                                 | 105.5                                  | 104.7                                  | 103.9                                  |
| 3150.0                                 | 119.9                                 | 110.2                                 | 108.7                                 | 107.2                                  | 106.6                                  | 105.6                                  |
| 4000.0                                 | 120.5                                 | 111.7                                 | 110.1                                 | 108.5                                  | 107.8                                  | 106.8                                  |
| 5000.0                                 | 121.1                                 | 113.1                                 | 111.1                                 | 109.7                                  | 108.8                                  | 108.2                                  |
| 6300.0                                 | 121.0                                 | 113.6                                 | 111.8                                 | 110.5                                  | 109.9                                  | 109.5                                  |
| 8000.0                                 | 120.1                                 | 113.8                                 | 112.3                                 | 110.8                                  | 110.3                                  | 110.1                                  |
| 10000.0                                | 119.9                                 | 113.8                                 | 112.5                                 | 111.2                                  | 111.2                                  | 111.2                                  |
| 12500.0                                | 119.1                                 | 113.8                                 | 112.9                                 | 111.9                                  | 111.1                                  | 111.0                                  |
| 16000.0                                | 118.4                                 | 113.4                                 | 113.0                                 | 111.8                                  | 111.2                                  | 110.9                                  |
| 20000.0                                | 117.6                                 | 112.7                                 | 112.8                                 | 111.3                                  | 110.8                                  | 110.3                                  |
| 25000.0                                | 116.8                                 | 112.2                                 | 112.6                                 | 111.0                                  | 110.5                                  | 109.8                                  |
| 31500.0                                | 115.8                                 | 111.5                                 | 112.1                                 | 110.1                                  | 109.7                                  | 108.8                                  |
| 40000.0                                | 115.1                                 | 111.7                                 | 111.6                                 | 109.2                                  | 109.4                                  | 108.0                                  |
| OVERALL<br>SPL                         | 130.6                                 | 123.9                                 | 123.1                                 | 121.6                                  | 121.1                                  | 120.6                                  |



SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 51.80 PSI, ATMOSPHERIC PRESSURE = 14.13 PSI  
RESERVOIR TEMPERATURE = 972.00 DEG.F, CHAMBER TEMPERATURE = 63.00 DEG.F  
RELATIVE HUMIDITY = 43.0 PERCENT  
GAMMA = 1.350

RUN NUMBER 191

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.666$   
TEMPERATURE RATIO  $TR = 2.738$   
MACH NUMBER  $MJ = 1.675$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 1.837$   
JET DENSITY RATIO  $DJ/D_0 = 0.544$   
JET VELOCITY RATIO  $VJ/A_0 = 2.270$   
JET VELOCITY  $VJ = 2544.3$  FPS

$TR/TJ = 1.491$   
 $DR/D_0 = 1.704$   
 $DR/DJ = 3.130$   
MASS FLOW = 2.263 POUNDS PER SECOND  
THRUST = 180.78 POUNDS

SHOCK CELL LENGTH  $S = 2.956$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 81.3                                   | 84.2                                   | 85.4                                   | 84.4                                    | 83.8                                    | 81.0                                    |
| 250.0                                  | 85.6                                   | 86.2                                   | 85.5                                   | 84.2                                    | 83.2                                    | 81.0                                    |
| 315.2                                  | 86.0                                   | 85.7                                   | 85.2                                   | 83.4                                    | 83.7                                    | 84.1                                    |
| 400.0                                  | 88.6                                   | 88.9                                   | 88.3                                   | 87.9                                    | 88.7                                    | 88.4                                    |
| 500.0                                  | 93.2                                   | 92.7                                   | 92.4                                   | 92.1                                    | 92.8                                    | 92.4                                    |
| 630.0                                  | 94.7                                   | 94.5                                   | 95.2                                   | 96.0                                    | 96.7                                    | 97.4                                    |
| 800.0                                  | 96.9                                   | 96.8                                   | 97.2                                   | 96.4                                    | 96.4                                    | 96.8                                    |
| 1000.0                                 | 98.7                                   | 99.0                                   | 98.7                                   | 97.0                                    | 96.0                                    | 96.1                                    |
| 1250.0                                 | 101.8                                  | 102.0                                  | 100.9                                  | 99.3                                    | 98.7                                    | 98.1                                    |
| 1600.0                                 | 103.8                                  | 103.2                                  | 102.2                                  | 100.8                                   | 99.8                                    | 99.6                                    |
| 2000.0                                 | 106.2                                  | 104.8                                  | 104.1                                  | 102.3                                   | 101.6                                   | 100.8                                   |
| 2500.0                                 | 107.3                                  | 106.2                                  | 104.8                                  | 103.6                                   | 103.0                                   | 101.9                                   |
| 3150.0                                 | 108.5                                  | 107.5                                  | 106.5                                  | 105.6                                   | 104.6                                   | 104.8                                   |
| 4000.0                                 | 109.7                                  | 108.9                                  | 107.7                                  | 107.2                                   | 107.1                                   | 107.9                                   |
| 5000.0                                 | 110.3                                  | 109.9                                  | 109.1                                  | 108.9                                   | 108.6                                   | 109.6                                   |
| 6300.0                                 | 111.3                                  | 111.8                                  | 110.4                                  | 110.1                                   | 109.5                                   | 110.3                                   |
| 8000.0                                 | 112.3                                  | 112.9                                  | 110.5                                  | 110.2                                   | 109.8                                   | 109.8                                   |
| 10000.0                                | 113.6                                  | 113.6                                  | 110.7                                  | 110.4                                   | 109.8                                   | 109.2                                   |
| 12500.0                                | 113.7                                  | 113.1                                  | 111.5                                  | 110.3                                   | 109.8                                   | 109.0                                   |
| 16000.0                                | 113.0                                  | 112.6                                  | 110.9                                  | 110.1                                   | 109.2                                   | 108.5                                   |
| 20000.0                                | 112.2                                  | 113.1                                  | 111.0                                  | 109.7                                   | 108.7                                   | 108.2                                   |
| 25000.0                                | 112.6                                  | 113.0                                  | 111.3                                  | 109.7                                   | 108.7                                   | 108.3                                   |
| 31500.0                                | 111.8                                  | 113.0                                  | 111.2                                  | 109.1                                   | 108.3                                   | 108.3                                   |
| 40000.0                                | 111.3                                  | 113.1                                  | 111.0                                  | 109.3                                   | 107.7                                   | 108.5                                   |
| OVERALL<br>SPL                         | 123.1                                  | 123.3                                  | 121.5                                  | 120.5                                   | 119.8                                   | 119.8                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE | MICRO<br>PHONE<br>NO. ANGLE |
|--|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|  | 16 127.5                    | 17 135.0                    | 18 142.5                    | 19 150.0                    |
| 200.0                                  | 10.0                        | 10.0                        | 10.0                        | 10.0                        |
| 250.0                                  | 10.0                        | 81.6                        | 82.2                        | 83.6                        |
| 315.2                                  | 83.7                        | 83.8                        | 84.9                        | 86.4                        |
| 400.0                                  | 87.2                        | 85.5                        | 86.0                        | 87.6                        |
| 500.0                                  | 91.6                        | 91.4                        | 91.6                        | 89.7                        |
| 630.0                                  | 97.2                        | 96.8                        | 94.1                        | 89.6                        |
| 800.0                                  | 97.0                        | 96.3                        | 94.8                        | 90.9                        |
| 1000.0                                 | 96.5                        | 94.9                        | 93.5                        | 93.1                        |
| 1250.0                                 | 97.9                        | 97.8                        | 97.5                        | 95.6                        |
| 1600.0                                 | 98.8                        | 99.0                        | 99.6                        | 97.8                        |
| 2000.0                                 | 100.3                       | 101.5                       | 102.3                       | 99.1                        |
| 2500.0                                 | 101.6                       | 103.0                       | 103.4                       | 102.6                       |
| 3150.0                                 | 105.1                       | 105.4                       | 105.1                       | 105.6                       |
| 4000.0                                 | 108.6                       | 108.0                       | 107.4                       | 108.8                       |
| 5000.0                                 | 109.6                       | 108.5                       | 107.8                       | 109.1                       |
| 6300.0                                 | 110.0                       | 109.0                       | 108.4                       | 108.9                       |
| 8000.0                                 | 109.6                       | 108.9                       | 107.6                       | 107.6                       |
| 10000.0                                | 109.2                       | 107.9                       | 106.8                       | 106.4                       |
| 12500.0                                | 108.5                       | 107.4                       | 106.1                       | 105.3                       |
| 16000.0                                | 107.9                       | 106.8                       | 105.6                       | 104.0                       |
| 20000.0                                | 107.3                       | 105.9                       | 104.8                       | 103.0                       |
| 25000.0                                | 107.1                       | 105.7                       | 104.9                       | 102.2                       |
| 31500.0                                | 106.6                       | 105.3                       | 104.5                       | 101.5                       |
| 40000.0                                | 106.4                       | 105.7                       | 104.2                       | 100.8                       |
| OVERALL<br>SPL                         | 119.3                       | 118.4                       | 117.6                       | 117.3                       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 51.50 PSI, ATMOSPHERIC PRESSURE = 14.21 PSI  
RESERVOIR TEMPERATURE = 1285.00 DEG.F, CHAMBER TEMPERATURE = 83.00 DEG.F  
RELATIVE HUMIDITY = 14.0 PERCENT  
GAMMA = 1.336

RUN NUMBER 112

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 4.624$   
TEMPERATURE RATIO  $TR = 3.214$   
MACH NUMBER  $MJ = 1.672$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 2.186$   
JET DENSITY RATIO  $DJ/D0 = 0.457$   
JET VELOCITY RATIO  $VJ/A0 = 2.473$   
JET VELOCITY  $VJ = 2824.4$  FPS

$TR/TJ = 1.470$   
 $DR/D0 = 1.439$   
 $DR/DJ = 3.146$   
MASS FLOW = 2.071 POUNDS PER SECOND  
THRUST = 180.24 POUNDS

SHOCK CELL LENGTH  $S = 2.949$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>1 15.0 | MICRO<br>PHONE<br>NO. ANGLE<br>2 22.5 | MICRO<br>PHONE<br>NO. ANGLE<br>3 30.0 | MICRO<br>PHONE<br>NO. ANGLE<br>4 37.5 | MICRO<br>PHONE<br>NO. ANGLE<br>5 45.0 | MICRO<br>PHONE<br>NO. ANGLE<br>6 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 107.7                                 | 105.5                                 | 103.6                                 | 101.3                                 | 20.0                                  | 20.0                                  |
| 250.0                                  | 110.2                                 | 110.2                                 | 109.3                                 | 105.7                                 | 102.4                                 | 20.0                                  |
| 315.2                                  | 114.3                                 | 113.6                                 | 112.6                                 | 109.3                                 | 104.8                                 | 101.5                                 |
| 400.0                                  | 115.8                                 | 117.2                                 | 115.5                                 | 112.7                                 | 109.2                                 | 105.0                                 |
| 500.0                                  | 117.5                                 | 118.6                                 | 119.0                                 | 116.0                                 | 111.7                                 | 107.2                                 |
| 630.0                                  | 115.7                                 | 120.1                                 | 121.9                                 | 119.5                                 | 116.3                                 | 111.6                                 |
| 800.0                                  | 117.5                                 | 121.4                                 | 123.5                                 | 122.2                                 | 119.5                                 | 115.3                                 |
| 1000.0                                 | 116.7                                 | 120.9                                 | 124.2                                 | 124.6                                 | 122.7                                 | 118.8                                 |
| 1250.0                                 | 117.6                                 | 122.3                                 | 125.2                                 | 126.2                                 | 125.4                                 | 122.3                                 |
| 1600.0                                 | 117.8                                 | 123.0                                 | 125.6                                 | 126.7                                 | 126.8                                 | 124.4                                 |
| 2000.0                                 | 117.8                                 | 124.2                                 | 127.0                                 | 127.1                                 | 128.2                                 | 127.0                                 |
| 2500.0                                 | 117.4                                 | 123.8                                 | 127.6                                 | 127.4                                 | 129.4                                 | 128.5                                 |
| 3150.0                                 | 116.3                                 | 122.7                                 | 126.4                                 | 127.2                                 | 130.3                                 | 129.6                                 |
| 4000.0                                 | 115.7                                 | 122.1                                 | 125.3                                 | 126.3                                 | 130.7                                 | 130.4                                 |
| 5000.0                                 | 113.8                                 | 120.8                                 | 124.2                                 | 125.0                                 | 129.1                                 | 130.0                                 |
| 6300.0                                 | 112.5                                 | 119.1                                 | 122.9                                 | 124.2                                 | 127.6                                 | 129.2                                 |
| 8000.0                                 | 110.1                                 | 117.4                                 | 121.2                                 | 122.9                                 | 126.2                                 | 127.7                                 |
| 10000.0                                | 109.7                                 | 115.2                                 | 121.1                                 | 122.9                                 | 124.9                                 | 126.5                                 |
| 12500.0                                | 107.1                                 | 114.8                                 | 118.6                                 | 120.7                                 | 123.9                                 | 125.4                                 |
| 16000.0                                | 105.6                                 | 113.0                                 | 117.0                                 | 119.4                                 | 122.7                                 | 124.2                                 |
| 20000.0                                | 103.6                                 | 111.3                                 | 115.7                                 | 118.2                                 | 121.3                                 | 122.9                                 |
| 25000.0                                | 101.9                                 | 110.0                                 | 114.6                                 | 117.1                                 | 120.4                                 | 122.2                                 |
| 31500.0                                | 100.0                                 | 108.7                                 | 113.5                                 | 115.8                                 | 119.2                                 | 121.5                                 |
| 40000.0                                | 98.1                                  | 107.8                                 | 112.5                                 | 115.1                                 | 117.7                                 | 121.1                                 |
| OVERALL<br>SPL                         | 128.2                                 | 133.3                                 | 136.3                                 | 136.9                                 | 139.0                                 | 139.0                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
|-------------------------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
| FREQ.<br>HZ             | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|                         | 7              | 60.0  | 8              | 67.5  | 9              | 75.0  | 10             | 82.5  | 11             | 90.0  | 12             | 97.5  |
| 200.0                   | 93.4           |       | 92.6           |       | 91.5           |       | 91.3           |       | 90.2           |       | 88.8           |       |
| 250.0                   | 95.6           |       | 93.5           |       | 92.2           |       | 92.2           |       | 91.0           |       | 90.1           |       |
| 315.2                   | 96.9           |       | 94.4           |       | 92.9           |       | 94.1           |       | 91.7           |       | 90.8           |       |
| 400.0                   | 100.7          |       | 97.6           |       | 96.5           |       | 95.3           |       | 94.6           |       | 94.2           |       |
| 500.0                   | 103.1          |       | 99.8           |       | 97.4           |       | 96.7           |       | 95.0           |       | 94.8           |       |
| 630.0                   | 106.8          |       | 102.6          |       | 100.9          |       | 99.4           |       | 97.7           |       | 96.8           |       |
| 800.0                   | 110.3          |       | 105.6          |       | 103.4          |       | 101.4          |       | 99.0           |       | 98.7           |       |
| 1000.0                  | 113.5          |       | 108.4          |       | 105.7          |       | 103.6          |       | 101.3          |       | 100.3          |       |
| 1250.0                  | 117.0          |       | 111.2          |       | 108.1          |       | 105.7          |       | 103.0          |       | 102.4          |       |
| 1600.0                  | 119.3          |       | 113.6          |       | 109.8          |       | 107.5          |       | 104.6          |       | 104.2          |       |
| 2000.0                  | 122.2          |       | 115.4          |       | 112.0          |       | 109.3          |       | 106.3          |       | 105.9          |       |
| 2500.0                  | 124.5          |       | 118.0          |       | 113.8          |       | 110.7          |       | 107.7          |       | 107.2          |       |
| 3150.0                  | 126.3          |       | 119.0          |       | 115.6          |       | 112.5          |       | 109.0          |       | 108.5          |       |
| 4000.0                  | 127.4          |       | 120.9          |       | 117.1          |       | 114.0          |       | 110.7          |       | 110.1          |       |
| 5000.0                  | 127.5          |       | 121.5          |       | 118.0          |       | 114.7          |       | 111.1          |       | 110.8          |       |
| 6300.0                  | 127.3          |       | 122.2          |       | 119.1          |       | 115.8          |       | 112.4          |       | 112.4          |       |
| 8000.0                  | 126.5          |       | 122.0          |       | 119.1          |       | 116.0          |       | 112.7          |       | 112.6          |       |
| 10000.0                 | 125.9          |       | 121.8          |       | 119.1          |       | 116.1          |       | 113.1          |       | 113.0          |       |
| 12500.0                 | 125.0          |       | 121.3          |       | 119.1          |       | 116.1          |       | 113.1          |       | 113.2          |       |
| 16000.0                 | 124.0          |       | 120.4          |       | 118.8          |       | 115.4          |       | 113.0          |       | 112.8          |       |
| 20000.0                 | 123.0          |       | 119.3          |       | 118.1          |       | 114.5          |       | 112.4          |       | 112.0          |       |
| 25000.0                 | 122.3          |       | 118.5          |       | 117.8          |       | 113.6          |       | 111.9          |       | 111.6          |       |
| 31500.0                 | 121.2          |       | 117.7          |       | 117.2          |       | 112.4          |       | 111.2          |       | 110.8          |       |
| 40000.0                 | 120.6          |       | 117.3          |       | 116.7          |       | 111.3          |       | 110.7          |       | 110.1          |       |
|                         |                |       |                |       |                |       |                |       |                |       |                |       |
| OVERALL<br>SPL          | 136.7          |       | 131.7          |       | 129.2          |       | 125.8          |       | 123.1          |       | 122.9          |       |

SUPERSONIC JET EXHAUST NOISE

MACH 1.7 NOZZLE

RESERVOIR PRESSURE = 51.50 PSI, ATMOSPHERIC PRESSURE = 14.13 PSI  
RESERVOIR TEMPERATURE = 1300.00 DEG.F, CHAMBER TEMPERATURE = 66.00 DEG.F  
RELATIVE HUMIDITY = 34.0 PERCENT  
GAMMA = 1.336

RUN NUMBER 192

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 4.645  
TEMPERATURE RATIO TR = 3.346  
MACH NUMBER MJ = 1.675  
JET STATIC TEMPERATURE RATIO TJ/T0 = 2.274  
JET DENSITY RATIO DJ/D0 = 0.440  
JET VELOCITY RATIO VJ/A0 = 2.526  
JET VELOCITY VJ = 2839.9 FPS

TR/TJ = 1.471  
DR/D0 = 1.388  
DR/DJ = 3.157  
MASS FLOW = 2.034 POUNDS PER SECOND  
THRUST = 180.87 POUNDS

SHOCK CELL LENGTH S = 2.957 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 82.9                                   | 84.9                                   | 86.8                                   | 86.4                                    | 84.8                                    | 82.8                                    |
| 250.0                                  | 86.4                                   | 87.5                                   | 86.5                                   | 85.6                                    | 83.8                                    | 82.5                                    |
| 315.2                                  | 87.6                                   | 87.9                                   | 86.8                                   | 85.9                                    | 85.8                                    | 85.6                                    |
| 400.0                                  | 90.1                                   | 90.3                                   | 90.0                                   | 89.2                                    | 89.5                                    | 90.1                                    |
| 500.0                                  | 94.1                                   | 93.9                                   | 93.6                                   | 93.9                                    | 93.6                                    | 93.6                                    |
| 630.0                                  | 96.4                                   | 95.8                                   | 96.0                                   | 96.8                                    | 98.1                                    | 98.5                                    |
| 800.0                                  | 98.9                                   | 98.3                                   | 98.4                                   | 97.8                                    | 98.4                                    | 99.0                                    |
| 1000.0                                 | 100.8                                  | 100.4                                  | 99.6                                   | 98.3                                    | 97.5                                    | 97.9                                    |
| 1250.0                                 | 103.6                                  | 103.3                                  | 101.4                                  | 100.9                                   | 100.1                                   | 99.5                                    |
| 1600.0                                 | 105.8                                  | 104.6                                  | 103.6                                  | 102.3                                   | 101.2                                   | 101.0                                   |
| 2000.0                                 | 107.8                                  | 106.0                                  | 105.2                                  | 104.3                                   | 103.3                                   | 102.1                                   |
| 2500.0                                 | 109.3                                  | 107.4                                  | 106.2                                  | 105.2                                   | 104.2                                   | 103.4                                   |
| 3150.0                                 | 110.6                                  | 108.8                                  | 108.1                                  | 107.3                                   | 105.8                                   | 105.7                                   |
| 4000.0                                 | 112.2                                  | 110.6                                  | 109.5                                  | 109.1                                   | 108.2                                   | 107.9                                   |
| 5000.0                                 | 112.6                                  | 111.1                                  | 110.6                                  | 110.1                                   | 110.0                                   | 109.1                                   |
| 6300.0                                 | 113.7                                  | 113.1                                  | 113.0                                  | 111.8                                   | 110.7                                   | 110.6                                   |
| 8000.0                                 | 114.2                                  | 114.1                                  | 112.9                                  | 111.7                                   | 110.7                                   | 110.3                                   |
| 10000.0                                | 115.1                                  | 114.7                                  | 113.0                                  | 112.0                                   | 110.8                                   | 110.3                                   |
| 12500.0                                | 115.8                                  | 114.4                                  | 112.9                                  | 112.1                                   | 111.0                                   | 110.0                                   |
| 16000.0                                | 115.3                                  | 114.2                                  | 112.7                                  | 112.1                                   | 110.9                                   | 109.9                                   |
| 20000.0                                | 114.1                                  | 114.4                                  | 112.4                                  | 111.6                                   | 110.1                                   | 109.4                                   |
| 25000.0                                | 114.0                                  | 114.0                                  | 112.4                                  | 111.6                                   | 110.1                                   | 109.5                                   |
| 31500.0                                | 112.9                                  | 113.9                                  | 112.1                                  | 110.8                                   | 109.6                                   | 109.3                                   |
| 40000.0                                | 112.1                                  | 113.6                                  | 111.5                                  | 110.8                                   | 108.8                                   | 109.4                                   |
| OVERALL<br>SPL                         | 124.9                                  | 124.5                                  | 123.1                                  | 122.2                                   | 121.1                                   | 120.6                                   |



1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |
|---------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 16    | 127.5 | 17    | 135.0 |
|         | 18    | 142.5 | 19    | 150.0 |
| 200.0   | 10.0  |       | 10.0  |       |
| 250.0   | 82.5  |       | 82.4  |       |
| 315.2   | 85.3  |       | 85.4  |       |
| 400.0   | 89.0  |       | 86.8  |       |
| 500.0   | 93.4  |       | 92.9  |       |
| 630.0   | 99.3  |       | 97.9  |       |
| 800.0   | 99.0  |       | 98.2  |       |
| 1000.0  | 98.6  |       | 96.4  |       |
| 1250.0  | 98.8  |       | 98.8  |       |
| 1600.0  | 100.1 |       | 100.3 |       |
| 2000.0  | 102.0 |       | 103.2 |       |
| 2500.0  | 102.6 |       | 104.0 |       |
| 3150.0  | 105.7 |       | 106.0 |       |
| 4000.0  | 109.1 |       | 109.0 |       |
| 5000.0  | 110.2 |       | 109.1 |       |
| 6300.0  | 110.8 |       | 110.2 |       |
| 8000.0  | 110.3 |       | 109.9 |       |
| 10000.0 | 109.9 |       | 109.0 |       |
| 12500.0 | 109.5 |       | 108.6 |       |
| 16000.0 | 109.2 |       | 108.3 |       |
| 20000.0 | 108.4 |       | 107.3 |       |
| 25000.0 | 108.1 |       | 107.0 |       |
| 31500.0 | 107.5 |       | 106.5 |       |
| 40000.0 | 107.2 |       | 106.7 |       |
|         |       |       | 104.4 |       |
| OVERALL |       |       |       |       |
| SPL     | 120.2 |       | 119.6 |       |
|         |       |       | 119.0 |       |
|         |       |       |       | 118.5 |

SUPERSONIC JET EXHAUST NOISE

MACH 2.0 NOZZLE

RESERVOIR PRESSURE = 89.50 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 74.00 DEG.F, CHAMBER TEMPERATURE = 77.00 DEG.F  
RELATIVE HUMIDITY = 60.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 84

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 7.348$   
TEMPERATURE RATIO  $TR = 0.994$   
MACH NUMBER  $MJ = 1.960$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 0.562$   
JET DENSITY RATIO  $DJ/D0 = 1.778$   
JET VELOCITY RATIO  $VJ/A0 = 1.470$   
JET VELOCITY  $VJ = 1669.3$  FPS

$TR/TJ = 1.768$   
 $DR/D0 = 7.389$   
 $DR/DJ = 4.156$   
MASS FLOW = 4.784 POUNDS PER SECOND  
THRUST = 247.49 POUNDS

SHOCK CELL LENGTH  $S = 3.707$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         |       |       |       |       | 4     | 37.5  |
|         |       |       |       |       | 5     | 45.0  |
|         |       |       |       |       | 6     | 52.5  |
| 200.0   | 103.3 | 103.0 | 96.6  | 20.0  | 88.8  | 86.7  |
| 250.0   | 106.6 | 106.5 | 101.0 | 94.3  | 92.0  | 89.9  |
| 315.2   | 111.4 | 108.4 | 104.8 | 98.2  | 94.6  | 93.6  |
| 400.0   | 113.2 | 112.8 | 108.0 | 102.7 | 97.7  | 96.5  |
| 500.0   | 116.5 | 115.0 | 111.0 | 104.4 | 100.6 | 97.8  |
| 630.0   | 115.9 | 116.7 | 114.9 | 108.2 | 103.3 | 100.1 |
| 800.0   | 118.7 | 120.0 | 117.1 | 110.9 | 106.1 | 102.4 |
| 1000.0  | 118.4 | 120.9 | 120.1 | 114.6 | 109.0 | 104.9 |
| 1250.0  | 119.0 | 122.1 | 122.5 | 117.4 | 111.8 | 106.5 |
| 1600.0  | 119.0 | 122.1 | 122.9 | 119.0 | 113.7 | 108.4 |
| 2000.0  | 118.8 | 122.8 | 124.0 | 120.7 | 115.6 | 109.9 |
| 2500.0  | 118.8 | 123.3 | 124.4 | 121.1 | 116.4 | 110.7 |
| 3150.0  | 118.2 | 122.9 | 125.1 | 121.6 | 116.8 | 111.5 |
| 4000.0  | 116.9 | 121.9 | 125.1 | 121.7 | 117.3 | 112.0 |
| 5000.0  | 115.1 | 120.3 | 123.9 | 120.9 | 116.7 | 112.5 |
| 6300.0  | 114.2 | 119.0 | 122.6 | 120.6 | 116.4 | 112.6 |
| 8000.0  | 112.7 | 117.4 | 121.2 | 119.4 | 115.7 | 112.3 |
| 10000.0 | 109.0 | 115.7 | 120.5 | 119.0 | 114.2 | 111.9 |
| 12500.0 | 110.0 | 115.5 | 119.1 | 117.3 | 114.4 | 112.0 |
| 16000.0 | 108.2 | 114.0 | 117.8 | 115.8 | 113.1 | 111.3 |
| 20000.0 | 106.3 | 112.6 | 116.8 | 114.8 | 112.1 | 110.6 |
| 25000.0 | 104.8 | 111.2 | 116.0 | 114.1 | 111.1 | 110.0 |
| 31500.0 | 103.2 | 110.3 | 115.3 | 113.2 | 110.2 | 109.4 |
| 40000.0 | 102.2 | 109.8 | 114.8 | 113.1 | 109.4 | 109.0 |
| OVERALL |       |       |       |       |       |       |
| SPL     | 129.1 | 132.6 | 134.3 | 131.2 | 126.9 | 123.1 |

# 1/3 OCTAVE SOUND PRESSURE LEVEL CONTINUED

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  |
|         | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
| 200.0   | 86.2  |       | 87.3  |       | 87.8  | 86.1  |
| 250.0   | 89.8  |       | 88.8  |       | 88.3  | 86.7  |
| 315.2   | 93.5  |       | 91.7  |       | 90.4  | 90.3  |
| 400.0   | 95.0  |       | 93.4  |       | 92.6  | 92.2  |
| 500.0   | 96.8  |       | 94.9  |       | 94.1  | 92.7  |
| 630.0   | 99.3  |       | 97.4  |       | 96.6  | 96.0  |
| 800.0   | 101.0 |       | 99.0  |       | 97.9  | 97.0  |
| 1000.0  | 102.4 |       | 100.7 |       | 99.5  | 98.5  |
| 1250.0  | 103.8 |       | 101.8 |       | 101.0 | 100.1 |
| 1600.0  | 104.8 |       | 103.2 |       | 102.2 | 101.0 |
| 2000.0  | 106.1 |       | 104.2 |       | 103.2 | 102.1 |
| 2500.0  | 106.7 |       | 104.8 |       | 103.7 | 102.6 |
| 3150.0  | 108.1 |       | 105.9 |       | 104.6 | 103.8 |
| 4000.0  | 108.9 |       | 106.7 |       | 105.6 | 104.7 |
| 5000.0  | 109.7 |       | 107.3 |       | 106.4 | 105.8 |
| 6300.0  | 110.3 |       | 108.1 |       | 106.8 | 106.1 |
| 8000.0  | 110.5 |       | 108.1 |       | 106.7 | 105.9 |
| 10000.0 | 110.8 |       | 108.1 |       | 106.6 | 106.1 |
| 12500.0 | 110.8 |       | 108.0 |       | 106.8 | 106.2 |
| 16000.0 | 110.2 |       | 107.8 |       | 107.0 | 105.7 |
| 20000.0 | 109.8 |       | 107.2 |       | 106.7 | 105.3 |
| 25000.0 | 109.2 |       | 106.8 |       | 106.6 | 104.9 |
| 31500.0 | 108.3 |       | 106.2 |       | 106.3 | 104.2 |
| 40000.0 | 107.9 |       | 106.2 |       | 105.8 | 103.5 |
| OVERALL |       |       |       |       |       |       |
| SPL     | 121.1 |       | 118.8 |       | 117.9 | 116.8 |
|         |       |       |       |       |       | 116.6 |
|         |       |       |       |       |       | 116.4 |

SUPERSONIC JET EXHAUST NOISE

MACH 2.0 NOZZLE

RESERVOIR PRESSURE = 90.50 PSI, ATMOSPHERIC PRESSURE = 14.24 PSI  
RESERVOIR TEMPERATURE = 55.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.400

RUN NUMBER 193

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 7.355  
TEMPERATURE RATIO TR = 0.990  
MACH NUMBER MJ = 1.960  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.560  
JET DENSITY RATIO DJ/D0 = 1.786  
JET VELOCITY RATIO VJ/A0 = 1.467  
JET VELOCITY VJ = 1639.7 FPS

TR/TJ = 1.768  
DR/D0 = 7.427  
DR/DJ = 4.159  
MASS FLOW = 4.796 POUNDS PER SECOND  
THRUST = 247.67 POUNDS

SHOCK CELL LENGTH S = 3.709 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 78.2                                   | 80.3                                   | 81.9                                   | 81.9                                    | 82.3                                    | 81.4                                    |
| 250.0                                  | 81.2                                   | 82.7                                   | 82.3                                   | 81.7                                    | 81.5                                    | 80.4                                    |
| 315.2                                  | 82.6                                   | 83.6                                   | 83.0                                   | 83.0                                    | 83.2                                    | 83.0                                    |
| 400.0                                  | 84.3                                   | 85.4                                   | 85.3                                   | 85.6                                    | 85.4                                    | 86.6                                    |
| 500.0                                  | 87.8                                   | 88.1                                   | 88.8                                   | 89.2                                    | 89.6                                    | 89.3                                    |
| 630.0                                  | 89.5                                   | 90.1                                   | 91.0                                   | 91.5                                    | 92.3                                    | 91.9                                    |
| 800.0                                  | 91.8                                   | 92.8                                   | 93.5                                   | 93.0                                    | 93.7                                    | 93.6                                    |
| 1000.0                                 | 93.6                                   | 95.2                                   | 95.7                                   | 95.7                                    | 95.4                                    | 95.6                                    |
| 1250.0                                 | 96.5                                   | 98.0                                   | 98.3                                   | 98.1                                    | 97.7                                    | 97.9                                    |
| 1600.0                                 | 98.4                                   | 99.5                                   | 99.0                                   | 98.6                                    | 98.4                                    | 98.6                                    |
| 2000.0                                 | 100.8                                  | 101.3                                  | 100.5                                  | 99.9                                    | 100.1                                   | 100.1                                   |
| 2500.0                                 | 102.1                                  | 102.1                                  | 101.4                                  | 101.0                                   | 101.9                                   | 102.2                                   |
| 3150.0                                 | 103.2                                  | 103.3                                  | 103.2                                  | 103.8                                   | 104.7                                   | 104.6                                   |
| 4000.0                                 | 104.8                                  | 105.1                                  | 104.8                                  | 104.7                                   | 105.7                                   | 105.4                                   |
| 5000.0                                 | 105.6                                  | 105.8                                  | 105.3                                  | 105.0                                   | 106.4                                   | 105.9                                   |
| 6300.0                                 | 106.0                                  | 106.5                                  | 106.3                                  | 106.1                                   | 106.8                                   | 106.3                                   |
| 8000.0                                 | 106.3                                  | 107.1                                  | 106.2                                  | 105.6                                   | 106.3                                   | 105.5                                   |
| 10000.0                                | 106.9                                  | 107.8                                  | 105.8                                  | 105.0                                   | 106.0                                   | 104.8                                   |
| 12500.0                                | 107.5                                  | 107.5                                  | 105.9                                  | 105.1                                   | 105.7                                   | 104.5                                   |
| 16000.0                                | 106.9                                  | 106.9                                  | 105.4                                  | 104.6                                   | 104.8                                   | 103.9                                   |
| 20000.0                                | 106.4                                  | 106.8                                  | 104.9                                  | 103.8                                   | 103.7                                   | 103.0                                   |
| 25000.0                                | 106.5                                  | 106.4                                  | 104.7                                  | 103.1                                   | 102.9                                   | 102.7                                   |
| 31500.0                                | 105.8                                  | 106.4                                  | 104.4                                  | 102.5                                   | 102.5                                   | 102.4                                   |
| 40000.0                                | 105.2                                  | 106.3                                  | 104.0                                  | 102.5                                   | 101.6                                   | 102.6                                   |
| OVERALL<br>SPL                         | 117.2                                  | 117.7                                  | 116.5                                  | 115.9                                   | 116.3                                   | 115.9                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 16<br>ANGLE 127.5 | MICRO<br>PHONE<br>NO. 7<br>ANGLE 35.3 | MICRO<br>PHONE<br>NO. 18<br>ANGLE 142.5 | MICRO<br>PHONE<br>NO. 19<br>ANGLE 150.0 |
|--|---|---------------------------------------|---|---|
| 200.0                                  | 78.6                                    | 0.0                                   | 77.2                                    | 76.5                                    |
| 250.0                                  | 80.6                                    | 0.0                                   | 80.0                                    | 79.5                                    |
| 315.2                                  | 82.5                                    | 0.0                                   | 81.7                                    | 81.0                                    |
| 400.0                                  | 86.1                                    | 0.0                                   | 84.3                                    | 84.1                                    |
| 500.0                                  | 89.6                                    | 0.0                                   | 87.6                                    | 86.6                                    |
| 630.0                                  | 92.1                                    | 0.0                                   | 90.1                                    | 88.2                                    |
| 800.0                                  | 92.7                                    | 0.0                                   | 91.6                                    | 90.7                                    |
| 1000.0                                 | 95.7                                    | 0.0                                   | 94.5                                    | 94.8                                    |
| 1250.0                                 | 97.7                                    | 0.0                                   | 97.2                                    | 96.1                                    |
| 1600.0                                 | 98.3                                    | 0.0                                   | 99.5                                    | 99.8                                    |
| 2000.0                                 | 99.4                                    | 0.0                                   | 101.7                                   | 101.6                                   |
| 2500.0                                 | 101.7                                   | 0.0                                   | 103.2                                   | 103.6                                   |
| 3150.0                                 | 103.9                                   | 0.0                                   | 104.1                                   | 104.8                                   |
| 4000.0                                 | 104.7                                   | 0.0                                   | 104.7                                   | 104.9                                   |
| 5000.0                                 | 105.2                                   | 0.0                                   | 104.3                                   | 103.9                                   |
| 6300.0                                 | 105.2                                   | 0.0                                   | 103.9                                   | 103.4                                   |
| 8000.0                                 | 104.4                                   | 0.0                                   | 102.6                                   | 102.4                                   |
| 10000.0                                | 103.8                                   | 0.0                                   | 101.7                                   | 101.0                                   |
| 12500.0                                | 103.3                                   | 0.0                                   | 100.8                                   | 100.2                                   |
| 16000.0                                | 102.4                                   | 0.0                                   | 100.0                                   | 98.7                                    |
| 20000.0                                | 101.4                                   | 0.0                                   | 98.9                                    | 97.4                                    |
| 25000.0                                | 100.9                                   | 0.0                                   | 98.4                                    | 96.4                                    |
| 31500.0                                | 100.4                                   | 0.0                                   | 98.0                                    | 95.6                                    |
| 40000.0                                | 100.0                                   | 0.0                                   | 97.4                                    | 94.8                                    |
| OVERALL<br>SPL                         | 114.8                                   | 0.0                                   | 113.9                                   | 113.6                                   |

SUPERSONIC JET EXHAUST NOISE

MACH 2.0 NOZZLE

RESERVOIR PRESSURE = 89.50 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 470.00 DEG.F, CHAMBER TEMPERATURE = 80.00 DEG.F  
RELATIVE HUMIDITY = 58.0 PERCENT  
GAMMA = 1.386

RUN NUMBER 85

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 7.348  
TEMPERATURE RATIO TR = 1.722  
MACH NUMBER MJ = 1.962  
JET STATIC TEMPERATURE RATIO TJ/T0 = 0.988  
JET DENSITY RATIO DJ/D0 = 1.012  
JET VELOCITY RATIO VJ/A0 = 1.950  
JET VELOCITY VJ = 2221.3 FPS

TR/TJ = 1.743  
DR/D0 = 4.266  
DR/DJ = 4.216  
MASS FLOW = 3.613 POUNDS PER SECOND  
THRUST = 248.03 POUNDS

SHOCK CELL LENGTH S = 3.713 INCHES



# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. ANGLE<br>1 15.0 | MICRO<br>PHONE<br>NO. ANGLE<br>2 22.5 | MICRO<br>PHONE<br>NO. ANGLE<br>3 30.0 | MICRO<br>PHONE<br>NO. ANGLE<br>4 37.5 | MICRO<br>PHONE<br>NO. ANGLE<br>5 45.0 | MICRO<br>PHONE<br>NO. ANGLE<br>6 52.5 |
|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| 200.0                                  | 106.3                                 | 104.5                                 | 98.7                                  | 93.9                                  | 98.2                                  | 92.8                                  |
| 250.0                                  | 109.4                                 | 107.9                                 | 104.3                                 | 99.0                                  | 100.4                                 | 95.7                                  |
| 315.2                                  | 113.6                                 | 110.9                                 | 108.6                                 | 103.2                                 | 101.6                                 | 97.5                                  |
| 400.0                                  | 115.3                                 | 115.9                                 | 111.8                                 | 107.1                                 | 103.8                                 | 99.4                                  |
| 500.0                                  | 118.5                                 | 118.0                                 | 114.7                                 | 110.8                                 | 105.5                                 | 101.0                                 |
| 630.0                                  | 117.1                                 | 119.3                                 | 118.4                                 | 113.9                                 | 107.7                                 | 104.2                                 |
| 800.0                                  | 119.4                                 | 122.0                                 | 121.5                                 | 116.9                                 | 111.0                                 | 107.4                                 |
| 1000.0                                 | 118.5                                 | 122.0                                 | 123.5                                 | 120.3                                 | 114.5                                 | 110.7                                 |
| 1250.0                                 | 119.4                                 | 123.0                                 | 125.3                                 | 123.0                                 | 117.4                                 | 113.1                                 |
| 1600.0                                 | 119.0                                 | 122.7                                 | 124.8                                 | 124.2                                 | 119.4                                 | 115.7                                 |
| 2000.0                                 | 118.8                                 | 123.2                                 | 125.4                                 | 125.3                                 | 121.8                                 | 118.2                                 |
| 2500.0                                 | 117.9                                 | 122.6                                 | 125.8                                 | 125.7                                 | 123.0                                 | 119.7                                 |
| 3150.0                                 | 116.6                                 | 121.9                                 | 125.4                                 | 126.0                                 | 124.3                                 | 121.1                                 |
| 4000.0                                 | 115.4                                 | 120.6                                 | 124.2                                 | 125.9                                 | 125.6                                 | 122.2                                 |
| 5000.0                                 | 114.1                                 | 119.6                                 | 122.4                                 | 124.1                                 | 125.7                                 | 122.9                                 |
| 6300.0                                 | 112.7                                 | 118.4                                 | 121.0                                 | 123.0                                 | 124.8                                 | 122.7                                 |
| 8000.0                                 | 111.0                                 | 117.0                                 | 119.8                                 | 121.6                                 | 123.3                                 | 121.7                                 |
| 10000.0                                | 109.9                                 | 115.8                                 | 118.9                                 | 120.6                                 | 121.9                                 | 121.0                                 |
| 12500.0                                | 108.8                                 | 114.6                                 | 117.8                                 | 119.6                                 | 121.0                                 | 120.3                                 |
| 16000.0                                | 107.4                                 | 113.3                                 | 116.5                                 | 118.5                                 | 120.0                                 | 119.5                                 |
| 20000.0                                | 105.7                                 | 112.0                                 | 115.6                                 | 117.5                                 | 118.7                                 | 118.6                                 |
| 25000.0                                | 104.4                                 | 110.9                                 | 115.0                                 | 116.8                                 | 117.9                                 | 118.0                                 |
| 31500.0                                | 102.7                                 | 109.9                                 | 114.4                                 | 115.9                                 | 117.5                                 | 117.4                                 |
| 40000.0                                | 101.7                                 | 109.5                                 | 113.8                                 | 115.7                                 | 117.6                                 | 117.3                                 |
| OVERALL<br>SPL                         | 129.2                                 | 132.8                                 | 135.0                                 | 135.1                                 | 134.3                                 | 132.1                                 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  |
|         | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |
| 200.0   | 88.7  |       | 89.5  |       | 90.0  | 88.4  |
| 250.0   | 90.8  |       | 90.5  |       | 89.8  | 88.4  |
| 315.2   | 92.9  |       | 93.0  |       | 91.0  | 91.3  |
| 400.0   | 96.0  |       | 94.8  |       | 93.8  | 93.7  |
| 500.0   | 97.6  |       | 96.3  |       | 95.6  | 93.4  |
| 630.0   | 100.2 |       | 99.0  |       | 98.3  | 97.0  |
| 800.0   | 103.1 |       | 100.9 |       | 100.0 | 98.5  |
| 1000.0  | 105.2 |       | 102.9 |       | 101.7 | 100.1 |
| 1250.0  | 107.2 |       | 104.8 |       | 103.6 | 102.0 |
| 1600.0  | 109.5 |       | 106.6 |       | 104.8 | 103.4 |
| 2000.0  | 111.2 |       | 108.3 |       | 106.3 | 104.6 |
| 2500.0  | 112.8 |       | 109.7 |       | 107.5 | 105.7 |
| 3150.0  | 114.3 |       | 111.2 |       | 108.8 | 107.3 |
| 4000.0  | 115.3 |       | 112.7 |       | 110.4 | 108.5 |
| 5000.0  | 116.4 |       | 114.0 |       | 111.5 | 110.0 |
| 6300.0  | 117.2 |       | 114.8 |       | 112.1 | 111.2 |
| 8000.0  | 117.2 |       | 115.2 |       | 112.8 | 111.8 |
| 10000.0 | 117.6 |       | 115.8 |       | 113.0 | 112.3 |
| 12500.0 | 117.3 |       | 116.1 |       | 113.6 | 112.7 |
| 16000.0 | 116.7 |       | 116.1 |       | 113.9 | 112.6 |
| 20000.0 | 116.2 |       | 115.7 |       | 113.8 | 112.2 |
| 25000.0 | 115.6 |       | 115.2 |       | 113.7 | 111.7 |
| 31500.0 | 114.8 |       | 114.6 |       | 113.4 | 111.0 |
| 40000.0 | 114.2 |       | 114.4 |       | 112.8 | 110.1 |
|         |       |       |       |       |       |       |
| OVERALL |       |       |       |       |       |       |
| SPL     | 127.5 |       | 126.0 |       | 123.9 | 122.4 |
|         |       |       |       |       |       | 121.9 |
|         |       |       |       |       |       | 121.7 |

SUPERSONIC JET EXHAUST NOISE

MACH 2.0 NOZZLE

RESERVOIR PRESSURE = 90.00 PSI, ATMOSPHERIC PRESSURE = 14.24 PSI  
RESERVOIR TEMPERATURE = 430.00 DEG.F, CHAMBER TEMPERATURE = 60.00 DEG.F  
RELATIVE HUMIDITY = 50.0 PERCENT  
GAMMA = 1.386

RUN NUMBER 194

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 7.320$   
TEMPERATURE RATIO  $TR = 1.712$   
MACH NUMBER  $MJ = 1.959$   
JET STATIC TEMPERATURE RATIO  $TJ/T_0 = 0.983$   
JET DENSITY RATIO  $DJ/D_0 = 1.017$   
JET VELOCITY RATIO  $VJ/A_0 = 1.943$   
JET VELOCITY  $VJ = 2171.5$  FPS

$TR/TJ = 1.741$   
 $DR/D_0 = 4.277$   
 $DR/DJ = 4.205$   
MASS FLOW = 3.618 POUNDS PER SECOND  
THRUST = 247.43 POUNDS

SHOCK CELL LENGTH  $S = 3.707$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 10.0                                   | 0.0                                    | 81.6                                   | 82.6                                    | 82.1                                    | 80.8                                    |
| 250.0                                  | 82.8                                   | 0.0                                    | 83.2                                   | 82.9                                    | 82.6                                    | 80.9                                    |
| 315.2                                  | 83.3                                   | 0.0                                    | 83.7                                   | 83.0                                    | 82.8                                    | 81.9                                    |
| 400.0                                  | 84.9                                   | 0.0                                    | 85.2                                   | 85.6                                    | 85.7                                    | 86.6                                    |
| 500.0                                  | 88.8                                   | 0.0                                    | 89.0                                   | 90.3                                    | 90.4                                    | 90.9                                    |
| 630.0                                  | 90.4                                   | 0.0                                    | 91.8                                   | 93.5                                    | 94.1                                    | 94.9                                    |
| 800.0                                  | 93.1                                   | 0.0                                    | 93.7                                   | 94.5                                    | 94.5                                    | 95.0                                    |
| 1000.0                                 | 94.5                                   | 0.0                                    | 95.7                                   | 95.9                                    | 96.0                                    | 96.4                                    |
| 1250.0                                 | 97.9                                   | 0.0                                    | 98.8                                   | 98.7                                    | 98.8                                    | 99.2                                    |
| 1600.0                                 | 99.8                                   | 0.0                                    | 99.8                                   | 99.8                                    | 99.5                                    | 99.3                                    |
| 2000.0                                 | 102.1                                  | 0.0                                    | 101.4                                  | 101.5                                   | 101.2                                   | 100.8                                   |
| 2500.0                                 | 103.8                                  | 0.0                                    | 102.3                                  | 102.8                                   | 102.8                                   | 103.3                                   |
| 3150.0                                 | 105.4                                  | 0.0                                    | 104.1                                  | 106.1                                   | 107.0                                   | 106.6                                   |
| 4000.0                                 | 106.8                                  | 0.0                                    | 106.6                                  | 108.6                                   | 108.7                                   | 108.2                                   |
| 5000.0                                 | 108.5                                  | 0.0                                    | 107.9                                  | 109.1                                   | 109.6                                   | 109.1                                   |
| 6300.0                                 | 109.6                                  | 0.0                                    | 109.0                                  | 110.1                                   | 110.1                                   | 109.8                                   |
| 8000.0                                 | 109.6                                  | 0.0                                    | 109.2                                  | 109.9                                   | 109.8                                   | 108.8                                   |
| 10000.0                                | 110.2                                  | 0.0                                    | 108.8                                  | 109.7                                   | 109.3                                   | 108.3                                   |
| 12500.0                                | 110.8                                  | 0.0                                    | 108.6                                  | 109.4                                   | 109.0                                   | 107.8                                   |
| 16000.0                                | 110.5                                  | 0.0                                    | 108.0                                  | 108.8                                   | 108.2                                   | 107.0                                   |
| 20000.0                                | 110.2                                  | 0.0                                    | 107.3                                  | 108.1                                   | 107.2                                   | 106.3                                   |
| 25000.0                                | 110.4                                  | 0.0                                    | 106.8                                  | 107.5                                   | 106.6                                   | 106.0                                   |
| 31500.0                                | 109.7                                  | 0.0                                    | 106.0                                  | 106.9                                   | 106.2                                   | 106.0                                   |
| 40000.0                                | 109.4                                  | 0.0                                    | 105.1                                  | 107.0                                   | 105.4                                   | 106.2                                   |
| OVERALL<br>SPL                         | 120.5                                  | 117.7                                  | 118.7                                  | 119.7                                   | 119.4                                   | 118.9                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 16    | 127.5 | 7     | 35.3  | 18    | 142.5 | 19    | 150.0 |  |
| 200.0   | 79.9  |       | 0.0   |       | 77.0  |       | 77.0  |       |  |
| 250.0   | 81.8  |       | 0.0   |       | 80.7  |       | 80.2  |       |  |
| 315.2   | 82.8  |       | 0.0   |       | 83.7  |       | 82.8  |       |  |
| 400.0   | 86.1  |       | 0.0   |       | 85.0  |       | 85.5  |       |  |
| 500.0   | 92.0  |       | 0.0   |       | 90.3  |       | 88.6  |       |  |
| 630.0   | 95.8  |       | 0.0   |       | 92.7  |       | 89.0  |       |  |
| 800.0   | 94.8  |       | 0.0   |       | 93.5  |       | 90.8  |       |  |
| 1000.0  | 97.0  |       | 0.0   |       | 94.7  |       | 94.0  |       |  |
| 1250.0  | 99.2  |       | 0.0   |       | 98.5  |       | 97.4  |       |  |
| 1600.0  | 99.4  |       | 0.0   |       | 99.8  |       | 99.4  |       |  |
| 2000.0  | 100.6 |       | 0.0   |       | 103.9 |       | 104.7 |       |  |
| 2500.0  | 103.7 |       | 0.0   |       | 104.4 |       | 105.6 |       |  |
| 3150.0  | 107.0 |       | 0.0   |       | 107.4 |       | 109.0 |       |  |
| 4000.0  | 108.6 |       | 0.0   |       | 108.6 |       | 109.1 |       |  |
| 5000.0  | 109.3 |       | 0.0   |       | 108.3 |       | 108.2 |       |  |
| 6300.0  | 109.3 |       | 0.0   |       | 107.8 |       | 107.6 |       |  |
| 8000.0  | 108.5 |       | 0.0   |       | 106.5 |       | 106.1 |       |  |
| 10000.0 | 107.9 |       | 0.0   |       | 105.4 |       | 104.7 |       |  |
| 12500.0 | 106.9 |       | 0.0   |       | 104.4 |       | 103.8 |       |  |
| 16000.0 | 106.2 |       | 0.0   |       | 103.7 |       | 102.4 |       |  |
| 20000.0 | 105.3 |       | 0.0   |       | 102.6 |       | 101.1 |       |  |
| 25000.0 | 104.7 |       | 0.0   |       | 102.2 |       | 100.2 |       |  |
| 31500.0 | 104.2 |       | 0.0   |       | 102.0 |       | 99.5  |       |  |
| 40000.0 | 104.0 |       | 0.0   |       | 101.6 |       | 98.8  |       |  |
| OVERALL |       |       |       |       |       |       |       |       |  |
| SPL     | 118.4 |       | 0.0   |       | 117.2 |       | 117.2 |       |  |

# SUPERSONIC JET EXHAUST NOISE

MACH 2.0 NOZZLE

RESERVOIR PRESSURE = 88.60 PSI, ATMOSPHERIC PRESSURE = 14.10 PSI  
RESERVOIR TEMPERATURE = 855.00 DEG.F, CHAMBER TEMPERATURE = 80.00 DEG.F  
RELATIVE HUMIDITY = 56.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 86

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO PR = 7.284  
TEMPERATURE RATIO TR = 2.435  
MACH NUMBER MJ = 1.960  
JET STATIC TEMPERATURE RATIO TJ/T0 = 1.437  
JET DENSITY RATIO DJ/D0 = 0.696  
JET VELOCITY RATIO VJ/A0 = 2.349  
JET VELOCITY VJ = 2675.6 FPS

TR/TJ = 1.695  
DR/D0 = 2.991  
DR/DJ = 4.297  
MASS FLOW = 2.993 POUNDS PER SECOND  
THRUST = 247.54 POUNDS

SHOCK CELL LENGTH S = 3.708 INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3     |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       |
| CENTER  | PHONE |       | PHONE |       | PHONE |       |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |
| HZ      | 1     | 15.0  | 2     | 22.5  | 3     | 30.0  |
|         | 4     | 37.5  | 5     | 45.0  | 6     | 52.5  |
| 200.0   | 107.8 |       | 106.6 |       | 100.8 | 97.3  |
| 250.0   | 110.1 |       | 109.7 |       | 106.2 | 101.7 |
| 315.2   | 115.2 |       | 112.8 |       | 110.1 | 105.9 |
| 400.0   | 117.0 |       | 117.0 |       | 114.4 | 109.4 |
| 500.0   | 119.0 |       | 119.4 |       | 117.1 | 113.1 |
| 630.0   | 117.1 |       | 119.9 |       | 120.6 | 116.6 |
| 800.0   | 118.9 |       | 122.3 |       | 122.6 | 120.0 |
| 1000.0  | 117.8 |       | 121.7 |       | 124.1 | 122.3 |
| 1250.0  | 118.7 |       | 122.5 |       | 125.0 | 124.6 |
| 1600.0  | 118.1 |       | 122.5 |       | 124.9 | 125.5 |
| 2000.0  | 117.9 |       | 122.6 |       | 125.8 | 126.4 |
| 2500.0  | 116.4 |       | 122.1 |       | 125.2 | 126.6 |
| 3150.0  | 115.3 |       | 120.7 |       | 123.9 | 126.3 |
| 4000.0  | 114.1 |       | 119.9 |       | 123.3 | 125.6 |
| 5000.0  | 112.9 |       | 118.5 |       | 122.2 | 124.3 |
| 6300.0  | 111.8 |       | 117.3 |       | 120.8 | 123.4 |
| 8000.0  | 110.5 |       | 116.0 |       | 119.6 | 122.1 |
| 10000.0 | 109.6 |       | 115.0 |       | 118.4 | 121.2 |
| 12500.0 | 108.7 |       | 114.0 |       | 117.4 | 120.3 |
| 16000.0 | 107.5 |       | 112.9 |       | 116.3 | 119.3 |
| 20000.0 | 105.7 |       | 111.7 |       | 115.3 | 118.5 |
| 25000.0 | 104.6 |       | 110.9 |       | 114.8 | 117.6 |
| 31500.0 | 102.8 |       | 109.7 |       | 114.0 | 116.5 |
| 40000.0 | 101.7 |       | 109.1 |       | 113.6 | 116.2 |
| OVERALL |       |       |       |       |       |       |
| SPL     | 128.7 |       | 132.5 |       | 134.9 | 135.9 |
|         |       |       |       |       | 134.4 | 134.2 |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| OCTAVE  | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       | MICRO |       |  |
| CENTER  | PHONE |       | PHONE |       | PHONE |       | PHONE |       | PHONE |       | PHONE |       |  |
| FREQ.   | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE | NO.   | ANGLE |  |
| HZ      | 7     | 60.0  | 8     | 67.5  | 9     | 75.0  | 10    | 82.5  | 11    | 90.0  | 12    | 97.5  |  |
| 200.0   | 91.3  |       | 90.6  |       | 91.8  |       | 89.0  |       | 88.7  |       | 86.8  |       |  |
| 250.0   | 94.6  |       | 91.2  |       | 91.0  |       | 89.3  |       | 89.4  |       | 89.3  |       |  |
| 315.2   | 95.4  |       | 93.4  |       | 93.3  |       | 92.0  |       | 91.5  |       | 90.4  |       |  |
| 400.0   | 98.5  |       | 96.5  |       | 95.5  |       | 94.9  |       | 94.1  |       | 93.2  |       |  |
| 500.0   | 99.8  |       | 97.6  |       | 96.8  |       | 95.6  |       | 93.9  |       | 94.4  |       |  |
| 630.0   | 102.6 |       | 100.6 |       | 99.2  |       | 97.9  |       | 97.4  |       | 96.1  |       |  |
| 800.0   | 105.8 |       | 102.6 |       | 101.2 |       | 100.1 |       | 99.4  |       | 99.0  |       |  |
| 1000.0  | 108.2 |       | 104.8 |       | 103.8 |       | 101.2 |       | 100.5 |       | 99.6  |       |  |
| 1250.0  | 110.9 |       | 106.9 |       | 105.2 |       | 103.3 |       | 102.8 |       | 102.0 |       |  |
| 1600.0  | 113.4 |       | 109.0 |       | 107.0 |       | 104.9 |       | 104.0 |       | 103.1 |       |  |
| 2000.0  | 116.2 |       | 110.8 |       | 108.7 |       | 106.7 |       | 105.6 |       | 104.6 |       |  |
| 2500.0  | 118.0 |       | 112.6 |       | 110.3 |       | 108.2 |       | 106.8 |       | 106.0 |       |  |
| 3150.0  | 119.6 |       | 114.5 |       | 111.8 |       | 109.7 |       | 108.3 |       | 107.6 |       |  |
| 4000.0  | 120.6 |       | 116.4 |       | 113.7 |       | 111.1 |       | 109.7 |       | 108.8 |       |  |
| 5000.0  | 121.6 |       | 117.9 |       | 114.9 |       | 112.4 |       | 111.3 |       | 110.8 |       |  |
| 6300.0  | 121.9 |       | 118.8 |       | 115.8 |       | 113.8 |       | 112.8 |       | 112.3 |       |  |
| 8000.0  | 121.4 |       | 119.2 |       | 116.4 |       | 114.3 |       | 113.3 |       | 112.9 |       |  |
| 10000.0 | 121.4 |       | 119.4 |       | 116.7 |       | 115.0 |       | 113.8 |       | 113.7 |       |  |
| 12500.0 | 120.9 |       | 119.4 |       | 117.1 |       | 115.4 |       | 114.2 |       | 114.2 |       |  |
| 16000.0 | 120.1 |       | 119.2 |       | 117.3 |       | 115.3 |       | 114.4 |       | 114.1 |       |  |
| 20000.0 | 119.2 |       | 118.3 |       | 117.0 |       | 114.9 |       | 114.0 |       | 113.4 |       |  |
| 25000.0 | 118.4 |       | 117.5 |       | 116.7 |       | 114.6 |       | 113.7 |       | 112.8 |       |  |
| 31500.0 | 117.6 |       | 116.7 |       | 116.1 |       | 113.7 |       | 113.1 |       | 112.0 |       |  |
| 40000.0 | 117.0 |       | 116.5 |       | 115.5 |       | 112.8 |       | 112.8 |       | 111.1 |       |  |
| OVERALL |       |       |       |       |       |       |       |       |       |       |       |       |  |
| SPL     | 131.5 |       | 129.1 |       | 127.1 |       | 125.0 |       | 124.0 |       | 123.4 |       |  |



SUPERSONIC JET EXHAUST NOISE

MACH 2.0 NOZZLE

RESERVOIR PRESSURE = 89.50 PSI, ATMOSPHERIC PRESSURE = 14.24 PSI  
RESERVOIR TEMPERATURE = 822.00 DEG.F, CHAMBER TEMPERATURE = 62.00 DEG.F  
RELATIVE HUMIDITY = 42.0 PERCENT  
GAMMA = 1.362

RUN NUMBER 195

MICROPHONES ARE TWELVE FEET FROM THE NOZZLE EXIT PLANE

PRESSURE RATIO  $PR = 7.285$   
TEMPERATURE RATIO  $TR = 2.456$   
MACH NUMBER  $MJ = 1.960$   
JET STATIC TEMPERATURE RATIO  $TJ/T0 = 1.449$   
JET DENSITY RATIO  $DJ/D0 = 0.690$   
JET VELOCITY RATIO  $VJ/A0 = 2.359$   
JET VELOCITY  $VJ = 2641.9$  FPS

$TR/TJ = 1.695$   
 $DR/D0 = 2.966$   
 $DR/DJ = 4.297$   
MASS FLOW = 2.981 POUNDS PER SECOND  
THRUST = 247.57 POUNDS

SHOCK CELL LENGTH  $S = 3.708$  INCHES

# 1/3 OCTAVE SOUND PRESSURE LEVEL

| 1/3<br>OCTAVE<br>CENTER<br>FREQ.<br>HZ | MICRO<br>PHONE<br>NO. 10<br>ANGLE 82.5 | MICRO<br>PHONE<br>NO. 11<br>ANGLE 90.0 | MICRO<br>PHONE<br>NO. 12<br>ANGLE 97.5 | MICRO<br>PHONE<br>NO. 13<br>ANGLE 105.0 | MICRO<br>PHONE<br>NO. 14<br>ANGLE 112.5 | MICRO<br>PHONE<br>NO. 15<br>ANGLE 120.0 |
|--|--|--|--|---|---|---|
| 200.0                                  | 10.0                                   | 0.0                                    | 89.4                                   | 84.3                                    | 83.0                                    | 81.7                                    |
| 250.0                                  | 84.8                                   | 0.0                                    | 92.2                                   | 85.2                                    | 84.1                                    | 82.8                                    |
| 315.2                                  | 86.1                                   | 0.0                                    | 88.7                                   | 84.5                                    | 83.9                                    | 82.9                                    |
| 400.0                                  | 87.3                                   | 0.0                                    | 91.3                                   | 87.3                                    | 87.4                                    | 87.8                                    |
| 500.0                                  | 91.3                                   | 0.0                                    | 93.7                                   | 92.7                                    | 92.8                                    | 93.3                                    |
| 630.0                                  | 93.7                                   | 0.0                                    | 96.8                                   | 95.7                                    | 96.3                                    | 97.5                                    |
| 800.0                                  | 96.1                                   | 0.0                                    | 98.4                                   | 96.3                                    | 96.3                                    | 97.8                                    |
| 1000.0                                 | 97.2                                   | 0.0                                    | 98.5                                   | 97.4                                    | 96.8                                    | 97.0                                    |
| 1250.0                                 | 100.6                                  | 0.0                                    | 101.6                                  | 100.0                                   | 99.4                                    | 99.5                                    |
| 1600.0                                 | 102.3                                  | 0.0                                    | 102.4                                  | 101.2                                   | 100.4                                   | 100.4                                   |
| 2000.0                                 | 105.0                                  | 0.0                                    | 104.1                                  | 103.0                                   | 102.1                                   | 101.9                                   |
| 2500.0                                 | 106.9                                  | 0.0                                    | 105.2                                  | 104.3                                   | 103.5                                   | 103.5                                   |
| 3150.0                                 | 108.4                                  | 0.0                                    | 106.9                                  | 106.6                                   | 106.5                                   | 107.3                                   |
| 4000.0                                 | 110.1                                  | 0.0                                    | 109.1                                  | 109.2                                   | 109.2                                   | 109.6                                   |
| 5000.0                                 | 110.8                                  | 0.0                                    | 111.1                                  | 110.5                                   | 110.2                                   | 110.3                                   |
| 6300.0                                 | 112.3                                  | 0.0                                    | 112.2                                  | 111.4                                   | 111.0                                   | 111.0                                   |
| 8000.0                                 | 113.0                                  | 0.0                                    | 112.4                                  | 111.7                                   | 111.2                                   | 110.6                                   |
| 10000.0                                | 113.7                                  | 0.0                                    | 112.3                                  | 111.7                                   | 111.1                                   | 110.3                                   |
| 12500.0                                | 114.3                                  | 0.0                                    | 112.6                                  | 111.7                                   | 111.1                                   | 110.1                                   |
| 16000.0                                | 114.1                                  | 0.0                                    | 112.5                                  | 111.4                                   | 110.6                                   | 109.5                                   |
| 20000.0                                | 113.7                                  | 0.0                                    | 112.4                                  | 111.0                                   | 109.9                                   | 109.1                                   |
| 25000.0                                | 114.0                                  | 0.0                                    | 112.6                                  | 111.0                                   | 109.8                                   | 109.2                                   |
| 31500.0                                | 113.1                                  | 0.0                                    | 112.7                                  | 110.5                                   | 109.4                                   | 109.1                                   |
| 40000.0                                | 112.7                                  | 0.0                                    | 112.7                                  | 110.5                                   | 108.6                                   | 109.3                                   |
| OVERALL<br>SPL                         | 123.8                                  | 117.7                                  | 123.0                                  | 121.8                                   | 121.1                                   | 120.8                                   |

1/3 OCTAVE SOUND PRESSURE LEVEL  
CONTINUED

| 1/3                       |                |       |                |       |                |       |                |       |
|---------------------------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
| OCTAVE<br>CENTER<br>FREQ. | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       | MICRO<br>PHONE |       |
| HZ                        | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE | NO.            | ANGLE |
|                           | 16             | 127.5 | 7              | 35.3  | 18             | 142.5 | 19             | 150.0 |
| 200.0                     | 10.0           |       | 0.0            |       | 10.0           |       | 10.0           |       |
| 250.0                     | 81.8           |       | 0.0            |       | 81.5           |       | 80.8           |       |
| 315.2                     | 82.7           |       | 0.0            |       | 84.4           |       | 84.5           |       |
| 400.0                     | 87.4           |       | 0.0            |       | 86.1           |       | 87.5           |       |
| 500.0                     | 93.3           |       | 0.0            |       | 92.1           |       | 90.1           |       |
| 630.0                     | 98.2           |       | 0.0            |       | 94.6           |       | 91.4           |       |
| 800.0                     | 98.1           |       | 0.0            |       | 95.9           |       | 92.4           |       |
| 1000.0                    | 97.9           |       | 0.0            |       | 95.3           |       | 94.0           |       |
| 1250.0                    | 100.1          |       | 0.0            |       | 98.7           |       | 97.7           |       |
| 1600.0                    | 100.3          |       | 0.0            |       | 99.8           |       | 99.4           |       |
| 2000.0                    | 101.8          |       | 0.0            |       | 103.1          |       | 103.3          |       |
| 2500.0                    | 103.7          |       | 0.0            |       | 105.7          |       | 105.6          |       |
| 3150.0                    | 107.4          |       | 0.0            |       | 109.0          |       | 109.0          |       |
| 4000.0                    | 109.3          |       | 0.0            |       | 110.1          |       | 109.5          |       |
| 5000.0                    | 109.9          |       | 0.0            |       | 110.2          |       | 109.3          |       |
| 6300.0                    | 110.5          |       | 0.0            |       | 109.7          |       | 109.0          |       |
| 8000.0                    | 110.2          |       | 0.0            |       | 108.7          |       | 108.0          |       |
| 10000.0                   | 109.7          |       | 0.0            |       | 107.6          |       | 106.7          |       |
| 12500.0                   | 109.2          |       | 0.0            |       | 106.8          |       | 105.9          |       |
| 16000.0                   | 108.6          |       | 0.0            |       | 106.4          |       | 104.7          |       |
| 20000.0                   | 108.1          |       | 0.0            |       | 105.6          |       | 103.7          |       |
| 25000.0                   | 107.8          |       | 0.0            |       | 105.6          |       | 103.2          |       |
| 31500.0                   | 107.3          |       | 0.0            |       | 105.2          |       | 102.5          |       |
| 40000.0                   | 107.2          |       | 0.0            |       | 104.8          |       | 102.0          |       |
| OVERALL                   |                |       |                |       |                |       |                |       |
| SPL                       | 120.1          |       | 0.0            |       | 119.2          |       | 118.3          |       |